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ENGINEERING AND MINING JOURNAL-PRESS

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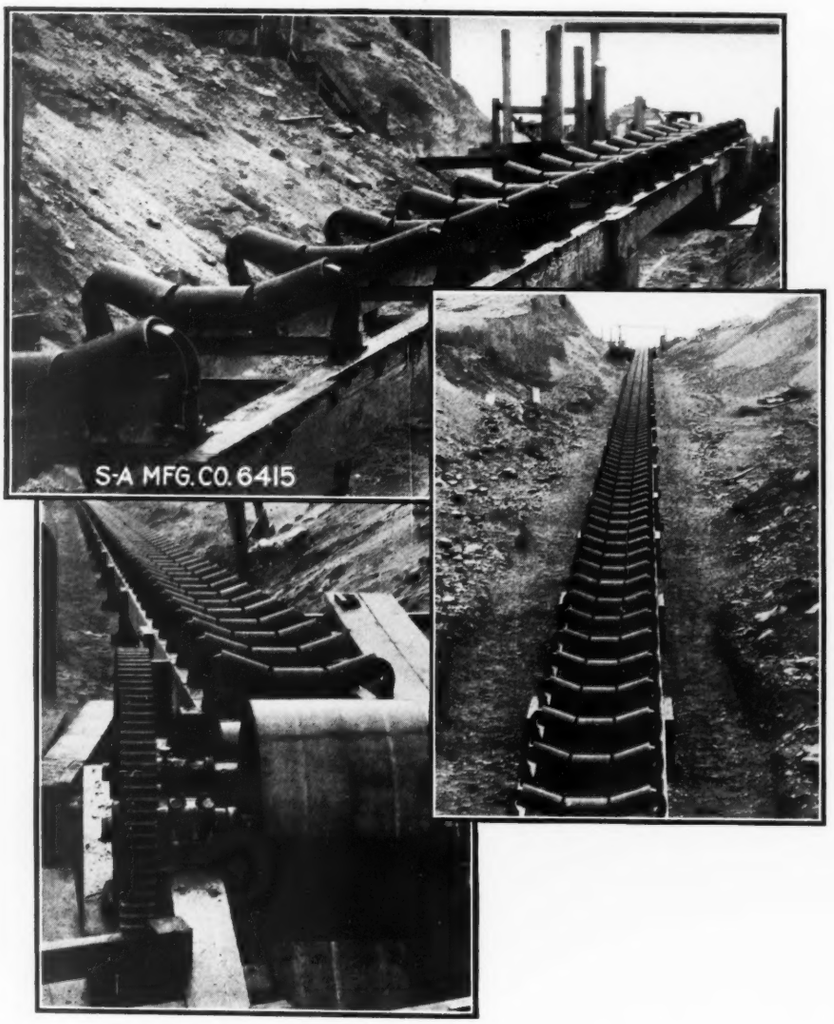
"Cutters" in the limestone country rock at Mount Pleasant, Tennessee from which the residual brown phosphate that is found in the district has been mined



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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

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Shall the Alaskan Railroad Be Scrapped?

REPRESENTATIVE A. M. FREE, of California, ranking member of the Committee on Merchant Marine and Fisheries in the House of Representatives, has just returned from Alaska, where he inspected the Government railroad. He has issued a statement that the railroad should be abandoned on the grounds that it serves a population of only 5,000 at a cost of $400 per capita per year, and at a loss to the government. While it may be true that there are only 5,000 people "on or near" the railroad, yet a glance at the atlas shows that the road extends to the very heart of this great territory, and that tributary to the road (excluding the Copper River valley and southeast Alaska) there are villages as far west as Nome, with a total population of 13,000, that receive a direct benefit from this road in the matter of mail, passenger service, and freight. Mr. Free should not forget the service rendered and time saved in transporting antitoxin to stricken Nome last winter from the railroad at Nenana 450 miles inland—a saving of eight to ten days, and undoubtedly the lives of many people at the isolated and frantic city. Every prospector, fisherman, woodchopper, and Indian in the Great Yukon valley, and as far north as the reindeer fields of the Artic, is benefited directly or indirectly by this road.

The census takes cognizance of only the permanent population. During every summer season there is usually a transient population of two or even three times the local citizenry that must be taken into consideration when reckoning in terms of abandonment. The purchase of Alaska was characterized as "Seward's Folly," yet who is there today that begrudges the original cost of $7,500,000? As business is organized at present, the expenditure of $60,000,000 largely upon the recommendation of the late Franklin K. Lane, Secretary of the Interior, is not excessively large in comparison with the cost of "Seward's Folly." Apparently, Mr. Free implies that this venture is "Lane's Folly," but, as a matter of fact, as in the case of Seward, Lane had the vision of a future empire north of "54 — 40."

Alaska has coal, copper, gold, and other minerals, to say nothing of timber, fisheries, and agricultural possibilities. Transportation is the key that will unlock the "frozen resources" of this Northland—frozen not because of cold but because of inaccessibility. A more liberal policy on the part of the federal government toward opening the timber and mineral lands, as well as the agricultural areas, would aid greatly in utilizing to the best advantage the railroad that Mr. Free says should be scrapped. He seems to think that this roadbed could be converted into an automobile highway. It could at the cost of many millions more, and yet Alaska would be without a railroad. To convert this as he suggests would necessitate concreting it the entire distance, or surfacing with gravel, and in many places the heavy fills would require widening for auto traffic. Sleds only could be used during the winter season, and for freighting purposes they are good for only twenty to thirty miles per day at the most, for until better means are devised for propelling sleds it would be necessary to depend entirely upon horses and dogs—a reversion to the early days.

Mr. Free fails to visualize the possibilities of Alaska. He can have no excuse for not seeing, as the sun shines twenty to twenty-four hours every day during the summer, and when the sun is not above the horizon there is ample twilight for viewing forest and stream. Open the territory to development, and this road will do its share in the establishment of a northwest empire of which this country may well be proud. It has never been contended that the road would pay dividends. It was a venture to assist in the development of the country. To abandon it in accordance with Mr. Free's recommendation would retard the development of this territory at least fifty years.

Coal, Steam, Electricity, Copper

WORLD PRODUCTION AND CONSUMPTION of coal were measurably less in 1924 than they were in 1913, notwithstanding the fact that in population, transportation, industrial activity, and the consumption of mechanical power—in all these 1924 greatly exceeded 1913. Incidentally, this decline in the quantity of coal used is one of the underlying reasons for the difficulties of coal miners and coal-mining companies in Great Britain and the United States; but there is another aspect of the situation. Why, in the face of greater expanded use of heat and power, has the consumption of coal declined? Among the reasons are: (a) the growing use of oil as a source of primary power, an excellent example being the development of oil-using engines for ocean-going vessels; (b) the progress in devising more efficient machinery for the utilization of coal in producing steam and for the translation of steam into mechanical energy, as illustrated in the immense increase in the ton-miles of freight moved by the railroad companies with a ton of coal, and (c) the expansion in the development of hydro-electric power to displace steam-generated electricity.

There is, however, another reason that is more important than all these—one that is growing in importance from month to month and from year to year. That is the tendency to use electric motors where steam engines have been used hitherto. A nice distinction can be made between this phase of the question and the use of water-power instead of steam for the generation of electricity; it concerns the method of the ultimate use of the power. No machine so combines the qualities of economy in first cost and in upkeep, of flexibility, reliability, and efficiency in operation, as the electric motor, in localities where reasonably cheap power is available.

The United States is many strides ahead of the rest

of the world in the use of electric motors. France, Germany, and Italy, though far behind this country, seem to realize the necessity for progress in this direction much more clearly than does Great Britain, which characteristically hates to confess that the wheels of progress are actually turning. John D. Ryan, of the Anaconda company, who returned recently from abroad, was deeply impressed by the trend toward the electrification of industrial plants and railroads in Europe. He declares that even Great Britain is awakening to the need for using labor-saving electrically operated machinery if she is to be able to compete with the other countries of the world.

England, as the leading producer and vendor of coal in Europe, does not want to see the market for coal decreased. Her salvation probably lies in the building of large central electric generating stations at the coal mines, thereby affording cheap, economical power and stimulating manufacture at home.

One would at least precipitate a vigorous argument if he were to say that the end of the age of coal and steam was in sight. At any rate the supremacy of the electric motor as the economical and efficient medium for running machinery of all kinds is well established. Apparently, nothing can prevent the world-wide demand for more motors from all kinds of industries. And every motor means copper; not alone in its own windings but in the construction of generators, distributing lines, and switchboard equipment. Is not the time at hand when the team of coal and steam will have to join a quartet in which the other members are electricity and copper?

The Best Source of Funds for Mine Development

IN THE LAST ANNUAL REPORT of the Federal Mining & Smelting Co., which operates the Morning mine, the well-known zinc-lead-silver producer in the Coeur d'Alene district in Idaho, and a group of lead-zinc properties in the Tri-State district, F. H. Brownell, the president, observes:

> "New properties have been vigorously sought by your company in other fields, particularly Idaho, Montana, and British Columbia. Its experience, like that of other companies similarly engaged, is that it is becoming extremely difficult to find new mines capable of profit, and the expense of exploration and investigation is so considerable that it may perhaps be questioned whether the incurring of such expense will much longer be justified."

This is a rather lugubrious view. It is true, of course, that the number of rich deposits is constantly decreasing, but this very fact makes it more and more out of the question for the prospector and the man or company with small resources to explore and develop properties to the point where a profitable enterprise is indicated. About all that he can do is to discover outcrops that look sufficiently promising to warrant further work.

It is also true that a few enterprises such as Central Copper and Boston-Montana seem to be able to raise plenty of money; but they add little or nothing to the mine output of metals. The alternatives are: either the large, established, and reputable companies must finance exploration and development, probably more than heretofore, or the production of metals gradually will decline. Since the latter eventuality is unlikely, the chances favor the former. Naturally the increased cost of prospecting, exploration, and development ultimately will be reflected in higher selling prices for the metals.

Determining the Meridian

IT WAS with considerable regret that *Mining Journal-Press* found it necessary to publish in its issue of Aug. 8, 1925, a letter from Mr. Howard R. Ward, stating that his short method of meridian and latitude determination, which had been described in the May 16 issue, had been found to be less useful and universal than he had hoped. It was at Mr. Ward's own request that his letter was published, a request compliance with which seemed obligatory, in justice to those who had read the details of the new method and who might be led into serious error in their surveying work by following it without verifying their results by other methods. This act on Mr. Ward's part was sportsmanlike and showed a high regard for his obligation toward his fellow engineers. He tacitly assumed all responsibility. But certainly the publication that broadcast the description of the method was equally responsible. Likewise the Coast and Geodetic Survey, which on Jan. 5 last wrote Mr. Ward: "We have studied your method and consider it worth publishing. We have checked a few values in your factor table and find them correct." On July 10, two months after the description of the method had appeared in the *Mining Journal-Press*, the Geodetic Survey again wrote Mr. Ward saying that it had to revise its first opinion, having found the method to be wrong in principle; that it would not work for hour angles other than about six or eighteen hours for azimuth, and zero and twelve hours for latitude.

It is likely that those engineers who have used the new method since it was announced have checked it by observation on Polaris, in the usual way. Thus they will scarcely have been led into serious error. But printed words are winged and travel far, and it is hoped that those who read about the method will also learn that it should be carefully used.

Mechanical Loading in Coal and Metal Mines

SUPPLEMENTING THE SERVICE that C. E. van Barneveld rendered the mining industry in preparing his bulletin on mechanical underground loading in metal mines, F. E. Cash and E. H. Johnson have just produced a much less pretentious but nevertheless a comprehensive report on mechanical loading in coal mines. The former work was the result of the cooperation of the U. S. Bureau of Mines and the Missouri School of Mines; the latter appears under the joint suspices of Carnegie Institute of Technology, the Bureau, and of an advisory board of operators and engineers. Messrs. Cash and Johnson, after having completed their survey, say that they concur in the oft-expressed opinion that there is no single system which has been or is likely to be developed that will prove a universal solution of the problem of mechanical loading in coal mines. There are too many variables involved, they say, to make it feasible to meet them all with one machine. A number of loaders are working satisfactorily, but all of them are in the development stage. Five main types of loading machines, including thirty-

one varieties, were studied in the course of the survey.

This statement of the authors is interesting in comparison with that made by Mr. van Barneveld when he says: "There are now available enough reliable mechanical loading appliances to satisfy the entire range of requirements in the mining of metallic and non-metallic minerals." There is no discrepancy between the two statements, however. Mr. van Barneveld says elsewhere that a universal mucking machine is as unattainable as a universal truck. Some of the machines built for specific conditions are applicable to a wide range of service in their present form, and some simple modifications may further expand their range. He points out that ruling characteristics differ widely in mining districts; that there is marked variation in types of ore deposits in the same district; that the size of orebody varies in the same type of deposit, and that consequently the scale of operations and size of workings also vary; that there are minor variations in adjoining mines on the same deposit; and that differing economic conditions may call for machines varying in size, power, ruggedness, speed, clean-up radius, first cost, and capacity. Hence he scraps the idea of a universal or general mucking machine.

Mr. van Barneveld's book—for that is what it is, with its 638 pages of discussion and description—should be of considerable interest to those engaged in mining coal. Many machines developed for all-round rock work may be used to advantage in coal-mine development. On the other hand, the newer bulletin on coal loading is less apt to benefit those who have to break and load hard material, because machines suitable for coal-mine practice may be worthless when required to perform the much severer kind of work. For all this, those concerned with loading in mines producing metals or nonmetals other than coal may be overlooking suggestions of value if they fail to follow what their coal-mining brethren are doing.

Manganese Problems

WITH THE SIGNING of the armistice the question of the country's manganese resources ceased to interest most people. Those who owned deposits or held stock in companies controlling them doubtless still felt some concern—a thrill of patriotism perhaps—but to the rest of the citizenry the matter was not one of pressing need. Manganese, a war mineral, was no longer such, because there was no longer any war. The war's lesson was not lost, however, to engineers at least, and one organization, the Mining and Metallurgical Society of America, having the needs of a future war in mind, appointed a subcommittee to report on the manganese resources of the United States.

This committee quickly arrived at the opinion that under natural conditions the country had practically no commercial high-grade ores. It proceeded to determine, however, how highly artificial conditions need be to shift important quantities of manganese-bearing material across the border line from waste to ore. But how should one tell what might be considered commercial ore, for low-grade waste today becomes ore tomorrow if the price of ore advances enough? The committee decided that a price at least one-half greater than the highest price obtaining during the recent war, and in which due account was taken of the decrease in purchasing power of money since pre-war days, would make really considerable quantities of ferro-grade ore commercially available. This price—the manganese index price—was found to be $50, which is four times the 1913 price. Everything was to be counted as ore (of ferro-grade) which could probably be produced at a $50 index price for 50 per cent ore, figured on the Eastern base.

Provided with this yardstick for measuring ore, the committee found that the "indicated total reasonably possible reserves at the $50 index price" of ferro-grade ores running +35 per cent Mn, for the entire country, were between 1,399,500 and 2,995,400 long tons, or, expressed as manganese, between 578,510 and 1,223,650 tons, and that the possible reserves of ores for making spiegel and manganese pig, ranging from 5 to 35 per cent manganese, at prices corresponding to the $50 index price for ferro-grade, ranged from 35,208,000 to 48,116,000 tons, or, in terms of manganese, from 2,114,290 to 3,064,700 tons for spiegel and from 2,147,500 to 2,858,750 for manganese pig.

The largest single item entering into these estimates of reserves is the tonnage of manganiferous iron ores on the Cuyuna range in Minnesota. It was estimated by the committee that prices corresponding to the $50 index price for ferro-grade ores would make available a tonnage of these manganiferous iron ores ranging from a minimum of 35,208,000 to a possible maximum of 48,116,000. Expressed in terms of manganese, this means 935,000 to 1,360,000 tons for spiegel and 2,050,000 to 2,700,000 tons of manganese for manganese pig.

These figures show the importance of the Cuyuna range deposits as a reserve to be drawn upon in a future emergency, if not before. Tests have already been undertaken to determine how the manganese can be most economically made available. The U. S. Bureau of Mines, at its Minneapolis station, has just blown out an experimental blast furnace after a continuous run of thirty-four days on 100 per cent Cuyuna manganiferous iron ores. The test was undertaken to show the feasibility of doing this and to ascertain the tonnage, fuel consumption, and recovery of manganese that may be expected in commercial operation. During the test, 134 tons of metal, varying from a few per cent up to 15 per cent manganese, was produced, which can now be used for further tests.

How to separate the phosphorus, iron, and manganese metallurgically is the next problem to be taken up by the Bureau. It is by no means impossible that the manganese reserve on the Cuyuna may be made available at prices less than those corresponding to the $50 index price for ores of ferro grade.

Only 77,343 Tons of Copper

THE WORLD'S STOCK of copper consists of refined metal in European and Japanese warehouses; blister, in transit between smelters and refineries in the United States and in process at refineries; and refined copper at American refineries. This last item constitutes the main part of the world's available and floating supply.

The American Bureau of Metal Statistics has just released figures showing that the stock of finished metal at American refineries on Aug. 31 was only 77,343 tons, a decrease of 10,065 tons during August and of 59,091 tons since Jan. 1. Moreover, the production of blister copper in North America was only 77,910 tons in August, much the lowest record for any month this year. No longer is curtailment a theory: it is a fact.

Mining Engineers of Note

Donald H. McLaughlin

TO BE CALLED to a full professorship in one of the oldest, most respected, and best-known universities in the United States at the age of thirty-three does not fall to the lot of many men. Yet with the opening of the fall term at Harvard University this month the chair of mining will be filled by Donald Hamilton McLaughlin, who was born on Dec. 15, 1891. With his coming to Harvard the program of mining engineering will be reorganized in such manner that it is believed the graduates in the course will be better fitted for their life work. The birthplace of Mr. McLaughlin is San Francisco, Calif., and his parents were William Henry and Katherine (Hamilton) McLaughlin. After his graduation from the Berkeley, Calif., High School he pursued his studies at the University of California, from which institution he received the degree of B. S. in mining engineering in 1914. He stood high in his studies, receiving the coveted Phi Beta Kappa key; he was also a member of the Sigma Xi fraternity. Harvard University first became acquainted with Mr. McLaughlin in the fall of 1914, when he entered the Graduate School of Fine Arts. There he received the degree of A. M. in 1915, and the degree of Ph.D. in 1917, the latter for work in economic geology. His doctor's thesis was on "The Occurrence and Significance of Bornite." While he was at Harvard he registered in seven full courses and nine half courses. This was a man's size job, but that Mr. McLaughlin was equal to it is shown by the fact that he achieved the grade of A in all of the courses. Harvard had an example of his abilities as an instructor during his post-graduate days there, for he was assistant in geology from 1915 to 1917. He was also Frederick Sheldon Traveling Fellow in 1916. During 1915 and 1916 he was also geologist with the Secondary Enrichment Investigation under L. C. Graton, professor of geology at Harvard. When war was declared by this country against Germany, he enlisted in the Engineers and received a commission of second lieutenant in 1917. Later he was promoted to a first lieutenancy. During 1917 and part of 1918 he was stationed at the Presidio in San Francisco and during the latter part of 1918 and in 1919 he was with the American Expeditionary Forces in France. On his return to the United States and his discharge from the Army he was appointed to the geological staff of the Cerro de Pasco Copper Corporation in Peru, and in 1921, when that department was reorganized and enlarged, he was made chief geologist, having direction of what is probably next to the largest geological department in the world supported by any mining company. In that capacity he had supervision of the programs of exploration and development of the corporation's extensive copper, silver, and coal mines and of the examination of other properties constantly offered to the corporation. He also was charged with numerous important negotiations of varied nature between the company and private concerns and between the company and the Peruvian Government. Mr. McLaughlin is a member of the American Institute of Mining and Metallurgical Engineers, and of the Society of Economic Geologists; likewise he is a Fellow of the Geological Society of America. He is the author, in co-operation with L. C. Graton, of "Geology of Engels Copper Deposit" and "Further Remarks on Engels," and, with A. M. Bateman, of "Geology of Ore Deposits in Kennecott, Alaska." He is also the author of "Geology of Evergreen Copper Mine."

DONALD HAMILTON McLAUGHLIN

Mr. McLaughlin is a member of the Phi Beta Kappa, Sigma Xi, Tau Beta Pi, Phi Lambda Upsilon, Theta Tau, and the Sociedad de Ingenieros del Peru, one of the prominent technical organizations in that country.

As professor of mining at Harvard Mr. McLaughlin succeeds Prof. H. L. Smyth, who has retired. As stated previously, the course in mining engineering at Harvard will be revised under Professor McLaughlin's direction. Hereafter the course will emphasize the fundamental subjects: mathematics, chemisty, physics, general engineering, and geology, and will make no effort toward proficiency in technique or toward trying to teach details that can be learned better in the mines.

How to Make Hollow-Block Plaster Models

Their Weight Is Only a Fractional Part of That of the Solid Variety and They Are Equally Serviceable—The Method Has Recently Been Shown to Be Feasible

By William B. McKinlay
Mining Engineer, New York City

BECAUSE OF THE SCARCITY of literature on the technique of making plaster blocks to serve as units of geological models or simple mine models, readers of the *Mining Journal-Press* may be interested to learn some details of a method which I conceived five or six years ago and have now demonstrated to be feasible.

The recent hollow-block work was done on the occasion of revising for a second time a large model consisting of thirty-six solid blocks. These blocks, said to have been made with about 85 per cent plaster of paris and 15 per cent portland cement, were surfaced with varnish and filler, colored with artists' oil paints and Higgins' waterproof inks to represent various classes of ore and proposed working levels, and finally given a protective coating of "dead-lac." After each revision, broken corners and edges were repaired by wetting the old plaster and then building up to normal by laying on successive coats of a thin plaster cream with a camel's hair brush. The patch is kept to the proper degree of moisture by touching with still thinner cream or plain water. When a certain degree of setting is noted, the patch is trimmed and smoothed with a clean and polished palette knife. For delicate work, tiny scalpels can be made by breaking blades of a safety razor to the required size and shape; mounting them by inserting into a split pencil stub or fragment of brush handle, and then binding with waxed thread.

Composition of Plaster Affects Time of Setting

In the manipulation of plaster of paris (called simply "plaster" by those who handle it extensively) it should be borne in mind that small percentages of different impurities may cause variations in the manner and time of setting. The addition of common salt to the water used in mixing the cream is reputed to hasten the setting. By mixing equal weights of the anhydrous sulphates of calcium and potassium, and then stirring up the mixture with less than their weight of water, the setting action is sudden; but by using four to five times the weight of water, the mixture is suitable for casting work. By using ordinary gypsum plaster, and mixing with a decoction of marshmallow root instead of plain water, the setting may be delayed for several hours or perhaps days. This suggests an avenue of research for the making of thin models and modeling of surfaces without the intermediate stages of modeling clay and casting molds. The final result is said to be a material approaching ivory in color, texture, and hardness. For models requiring no future chipping and revision, this marshmallow mixture may be excellent. However, for the beginner, it is wiser to choose one brand of plaster and to adopt a standard mixing practice for each individual job. He can try the novelty research out during his odd moments.

In painting the original model, large surfaces were coated by using an air brush, oiled-paper stencils being employed to confine the tinting to the desired spots. During revision, the painting was done with camel's hair brushes, sizes and shapes being selected as seemed most practicable or convenient. No great care is required for the first coats, which can be smeared on in any fashion so as to give a fairly uniform thickness. The best effect can be obtained by painting on the second coat with even, slightly overlapping parallel strokes in one direction, and later giving a third coat with thinner paint, applied in the same manner so as to flood the surface. Ample time should be given for drying of the successive coats of paint.

Solid Plaster Models Heavy and Cumbersome

The scale of the original model was 1 = 2,000; each block was nominally 10 x 20 cm. in horizontal cross-section, and the average height was about 35 cm.; making the average volume about 7,000 cu.cm. Trautwine (and presumably other authorities) gives the specific gravity of gypsum, plaster of paris, as 2.24 to 2.30, with an average of 2.27, but this ignores the voids of cast work, as ordinary set plaster will be found to have a specific gravity of 1.2 + , and surfaced blocks a specific gravity of at least 1.25. Assuming an average of only 1.25 for surfaced and painted blocks, each block of the model in question weighs something like 8,750 gm., or, say, an average of 20 lb. or more. On this basis, the entire set of thirty-six blocks weighs not far from half a ton; and is somewhat more cumbersome than a set of hollow blocks made of pasteboard, celluloid, or plaster.

In shifting plaster blocks about for study, they have a definite tendency to resist movement and then to yield suddenly. Even when the utmost care is observed, a disastrous collision may occur, necessitating tedious repair work.

The model referred to was made originally by an artisan who specializes principally in plaster models intended for exhibition, where artistic effect is more important than mere mathematical accuracy. Throughout the work he was guided more or less by an engineering staff that sought to have their detailed instructions fulfilled; but in work of this kind there must be a financial limit. Considering the method by which the model was designed and cast, and later divided into its component parts, it is an excellent piece of work and reflects credit on its maker and on those who conceived it and watched it in the different stages of its building and embellishment. To make a mathematically exact model by that method would cost more money than would be justified by the circumstances. A careful study of the existing literature on the making of all kinds of models for exhibition purposes shows that almost invariably the cost of the materials is insignificant when compared with the cost of labor expended in making them. If the workman is given positive instructions as to accuracy in certain measurements, he is

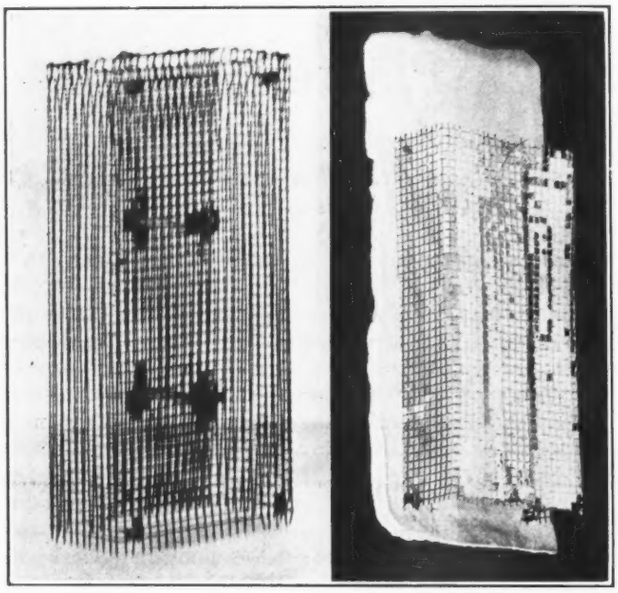


Fig. 1—Skeleton frame of block, with four points set in the plane of the first side to be cast. Fig 2—First side of block cast but not trimmed.

forced to demand many an honestly earned dollar in payment for his services, no matter how conscientiously perturbed he may be as the cost of the model mounts up and still upward. An accurate description of the details or technique followed in the preparation of the original model could be written best by the maker himself or by one closely associated with him in the work. But as this might involve the publication of some guild secrets, it is necessary to rely on the verbal statement of the artisan, making a few surmises here and there to fill up the gaps in the story.

How the Solid Model Was Made

Apparently the entire surface area of 1,200x2,400 meters was modelled in clay, using a topographical map as a pattern or guide, location of contours being controlled by bending strips of sheet metal cut to successive widths for each interval of rise. From the appearance of the final plaster blocks, it seems that, along the center line of the longer horizontal dimension of each proposed block, two nails were stuck into the clay at measured distances from the central point. On account of the mode of dividing the model into its separate blocks, as mentioned below, it was manifestly necessary to show some liberality in the measurements that determined the relativity of the different pairs of nail holes. Theoretically, each contour, instead of following *in toto* the usual wavy outline, should follow, for determined distances, lines parallel to the sides of the future blocks, in order to give the proper offset where each cut is to be made. However, it would not be practicable to model the clay with such nicety.

When the clay work was completed and checked over for errors and the repair of cracks due to premature drying, a pen was built around it and a plaster mold cast. This could be done by making up one batch of plaster cream in some type of concrete mixer, or else by having a number of assistants mix up uniform lots in separate pails.

When the mold had set and dried sufficiently, it was inverted, either before or after being separated from the clay and the dummy-filling within. In due time, and of course after the usual coating of the mold with some substance to give the required break of continuity of material to facilitate separation, the model was cast by pouring the required half ton or so of plaster cream into the mold. This matter of coating a subject or a mold so as to get a perfect separation is often very important. The best guide is actual experience with the kind of material being handled.

For the best results, the subject often requires liberal greasing; although when working on glass the opposite may be true. Too much coating may obstruct the entrance of air necessary for parting, and it tends to diminish accuracy of outline. The workman simply has to try to discover how he himself can accomplish best the desired result.

After pouring a large cast, a long wait is necessary for the model to dry out after setting. Several weeks may be required for a perfect drying, unless the workshop is equipped with some sort of air-conditioning plant to offset unfavorable weather conditions. When dry, the monolith model was carted to a carpenter shop,

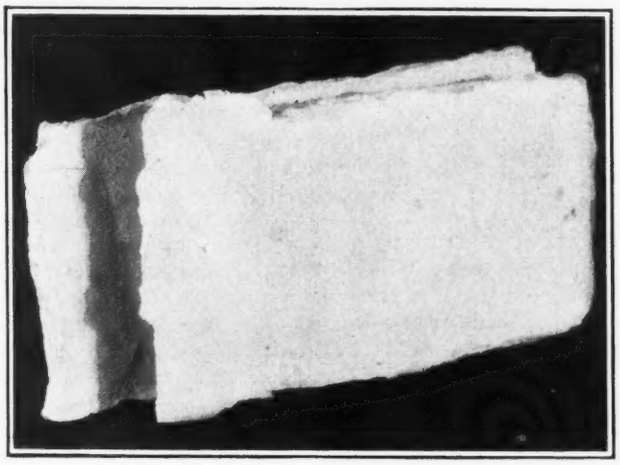


Fig. 3—Two sides cast but not trimmed. This illustrates also how a broken side can be patched with new plaster.

where a band saw was used to divide it into its thirty-six separate blocks. The alignment of the saw to its work, or vice versa, was facilitated by the nail holes cited above. If the width of saw cut happened to be exactly as anticipated, there was a fair gambling chance of the blocks emerging somewhere near the right size and with the residual topography reasonably correct.

Finishing the Solid Blocks a Difficult Task

Then followed what must have been a most maddening task, scraping and cutting and shaving and sandpapering the blocks to the point of being more correct than when emerging from the teeth of the saw. Further, breaks and minor defects on each block had to be patched with plaster and then allowed to dry out again before proceeding with the smoothing process. It must have been very difficult to coax and fudge each block until it would stand upright and give a semblance of harmonizing with all of its neighboring blocks. Small wonder that in a treatise on architecture, in a chapter devoted to the making of scale models, an author states that it is usual to have plaster models made at the atelier of some artisan, rather than to

attempt such a task in any well-regulated architectural office or drafting room.

For the making of a hollow-block model, no clumsy machinery is required; nor is it necessary to convert the workshop floor into such a sloppy shambles as was done in my own case in my first efforts. The work can be done on an ordinary drafting table. A convenient work bench would be a desk with a perfectly smooth plate glass top. Any fine woodwork or costly rugs should be draped, as is customary when a careful interior decorator "does over" an apartment or a luxuriously furnished office suite. In any case, the work should be done near a wash basin, with a pail handy for the disposition of unavoidable excess material.

Practical Details Outlined

The materials used will depend upon the size and purpose of the model and upon the nature and amount of future handling to which it is to be subjected. The following description should be sufficient to give a beginner an insight as to the principles involved in the method; after which he can work up the details to suit his own particular problem.

If it is desired to make a model consisting of many blocks with the same horizontal cross-section, it would be advisable to make one or two molds of wood, plaster, metal, or glass plates cut and ground to proper size. In the latter case it would not be necessary to grind more than one edge of each outer plate, or two edges of a pair. For the inner form, no such refinement would be required. The hollow tubes so cast should be long enough to cover all cases. It is easier to cut away than to piece out a short tube to the required length. When

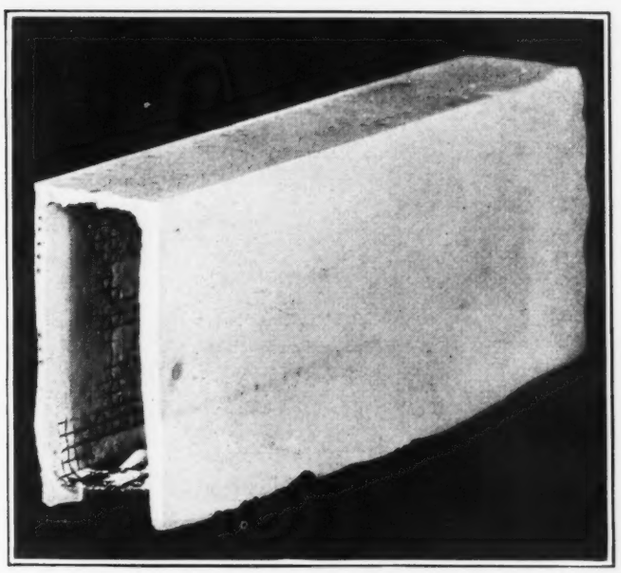


Fig. 4—Three sides of block cast.

so casting each tube at one pouring, the reinforcement frame may be omitted, making the walls thick enough to give the desired strength or painting on additional plaster on the inside. An almost infinite variety of expedients should suggest themselves to a resourceful mind. If many future revisions by other workmen are contemplated, the omission of materials foreign to the plaster may avert annoyance during the chipping away of plaster. However, the purpose of this article is to describe what has been done, rather than what may be done.

A hardware store supplied a square yard of common galvanized wire netting, of ¼ in. mesh. (An engineer may call this 4-mesh, but a hardware clerk seldom does.) From this netting, strips were cut of a width less than the height that the blocks were to be when completed. The exact difference is a matter of choice, governed largely by the estimated progress of excavation at the mine, as affecting future chipping away of plaster when revising the model. The handling of the wires is nothing to worry about. It is quite simple to manipulate them with small curved pliers of more or less the same shape as those employed by assayers in the handling of cupelled buttons. The long-nosed pliers with an inquisitive expression, such as sold to radio fans, cost about forty cents and are well worth the money.

The skeleton frames cut from these strips serve a double purpose. They give a tangible shape on which to start the blocks and they are desirable as reinforcement when thin walls are used. A carpenter having left a 3½-in. square oak post leaning up in a corner, it was a simple matter to shape each frame around it by bending and then beating gently with a surgeon's mallet procured from an army-surplus store. A mallet like this, and a bone chisel procured at the same place, made very handy tools for chipping plaster during revision. For each 10x20-cm. block, enough of a strip was taken to make a frame about 9x19 cm. in cross-section, with about 4 cm. overlap in the middle of one of the longer (wider) sides. The frame was then stood up on a sheet of plate glass; dimensions and right angles were verified; and the overlapping parts tied temporarily with wetted string and then soldered here and there by heating with matches and touching with wire solder of the spaghetti type, with soldering flux inside instead of cheese.

It is a good plan to do a little "timbering" on the inside, here and there, at obvious points, to give rigidity and strength, with 8x8x80-mm. white pine "stulls" and 4x12x40-mm. "wall plates." With netting 1 mm. thick, these dimensions will maintain the proper width of frame. A dab of hot sealing wax will be advantageous to keep them from jiggling out of place while handling the frame. To correct oversize bulging at any point, use wires with ends bent to hooks at the required distance. If it is desired to remove these later, use wire

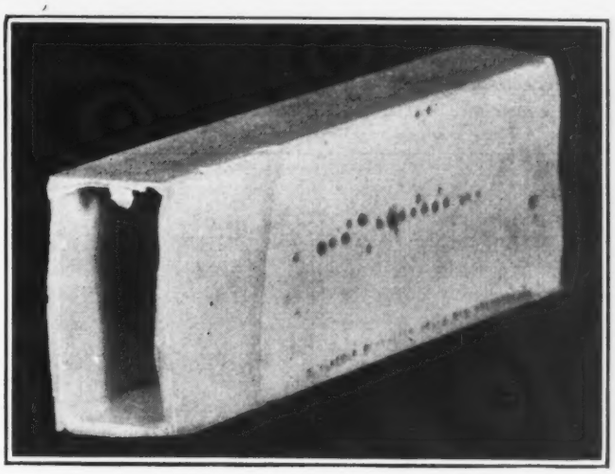


Fig. 5—Four sides of block cast and ready to trim for casting the base. One of the large sides has been patched and left without filling minor defects. A little more work would remove evidence of repairs.

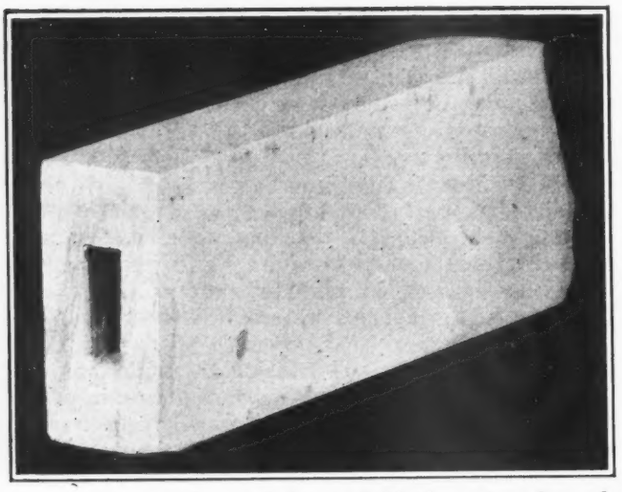


Fig. 6—Four sides and base of block cast and ready for plotting sections and trimming preparatory to clay modeling of top surface.

that will snip readily, such as ravelings from surplus netting.

When the frame passes inspection, cut several little squares of cork of a size to be squeezed into mesh openings. The tiny razor-blade scalpels make ideal tools for this work, if the blade or cork be moistened slightly. On one of the 19-cm. sides of the frame set four of these squares near the corners of the frame. Take four slim victrola needles or sewing needles and push part way through corks, working now from the inside of the frame. Then smear a little dab of hot sealing wax on cork, part of needle, and the adjacent netting. Repeat the operation on the opposite side of the frame. Then rest the frame on the plate glass, in such a way that it is supported on the points of four needles. Adjust one end at a time until there is a space of about 5 mm. between the glass and the netting. If too high or too low, heat the top of the corresponding needle with a match flame and adjust, wedging or jacking the frame, or lifting it from the glass, until the wax has cooled and hardened. Then adjust the other end. It is better to defer the adjustment of needles (or even their original insertion) on the other side of the frame until after casting the first side.

Casting the Hollow Blocks

With waterproof ink and ruling pen, draw on the plate glass the outline of one of the large sides of the block. Then, with wet modelling clay, costing from 69 to 75c. for a can of 5 lb., build a dam or inclosure to restrict the meandering of the plaster cream. The plate glass should be perfectly level, or else inclined very slightly toward what you wish to be the thicker end of the walls of the block. If it is desirable to keep the center of gravity of the final block as low as possible, the bottom of the walls may be made somewhat thicker than the top. Making a thick base accomplishes the same result and seems more satisfactory. It may be found that the plaster will separate from the glass more readily if the latter is prepared with a thin film of some oily substance before casting. This "parting," for casting the first two sides, may be prepared by passing lightly over the surface of the glass a dab of cotton moistened with soapy water.

Pick up the frame carefully and lower it gently to its proper position, which will be such as to give about 5 mm. clearance between frame and the ruled outline. The end with greater clearance is where the top of the final block is to be. Having procured from a painter's supply store about 15 or 20 lb. of "plaster," one is now ready for casting. In one hand hold a tin can such as is supplied as container for a pound of coffee, and in the other hand a common kitchen spoon. Fill the can about one-third to two-fifths full of plaster and release the spoon. Pick up a fork and proceed to the basin. Add to the plaster about the same quantity of water, stirring constantly with the fork. The exact amount of water required may be learned by experience. It should be just enough to make a thick cream that is of the right consistency for pouring. If thought desirable, the exact weights of plaster and water suitable for a given cast may be calculated, trusting to luck or superior skill in the matter of pouring all the material precisely where it is desired to place it. Keep stirring the cream until it is certain that all air, that might otherwise cause bubbles, has been expelled and the plaster is thoroughly mixed. Proceed to the work table, still stirring, and pour the pond or puddle. If the cream is right, it can be poured right through the upper meshes of the netting. Keep pouring until the area is covered. If the block is long and takes more plaster than calculated or guessed at, move speedily but methodically and mix up a little more cream. When the proper thickness has been poured, dump the excess plaster into a pail and rinse the can so that it will be clean when wanted next.

With a long spatula made of cardboard, wood, or metal reach in and muck the plaster about until it suits. A little thickening toward the corner edges and around the toy "timbering" may seem advisable. Then, while the plaster is setting, work can be done at something else. If several blocks are being made, the next one can

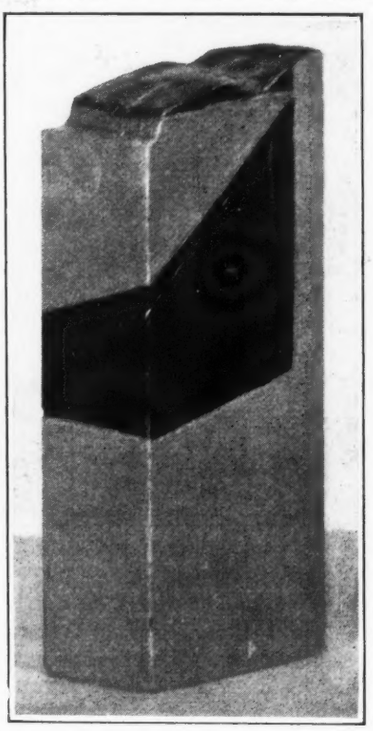


Fig. 7—Model block completed and ready for last coat of paint.

This illustration and the others accompanying this article are actual photographs of a set of miniature models, in various stages of progress, as supplied by the author. In the preparation of these miniatures, no extraordinary precautions were taken to have them scrupulously exact.

be started. A good plan is to arrange your work so that the plaster can be setting while you are out to lunch, or overnight.

When the plaster has set and is nearly dry, remove the clay dam and return the clay to stock in a wrapping of wet cloth. If the frame with the cast side will not lift readily from the plate glass, clean off the glass around it and grease a skidway with soapy water. Start the cast along gently and slide it off the table horizontally. It can usually be lifted off by starting gently with one end or edge. When the air starts in, the cast comes up with surprising facility. When neatly lifted, you will find the clear print of the inked lines marked on the plaster wherever the limits of the pond were exterior to the outline. These serve as guides for later trimming. Having lifted or slid the cast from the glass, set it aside in a safe place and clean off the glass. It is a good plan to have plenty of cheesecloth gauze and absorbent cotton on hand. Diluted alcohol is good for the final polishing. With a perfectly clean glass greasing before casting is not essential.

Set the frame on the glass again, with the cast side on top, after examining corks and needles to see if they are still there. If any qualms are felt as to future trouble arising from the presence of needles and corks that have once served their purpose, it is not a difficult matter to grasp the needles with the pliers, rotating and pulling gently until they come out; after which the corks may be cut out with the razor blade. Such work should be done during a regular trimming period. Adjust the needles with match flame, as when preparing for the first cast, and test the height of the upper surface with a pair of dividers or callipers. For blocks of the size stated, 10x20 cm., the height should be 10 cm., *less the thickness of the two surfaces of varnish and paint that will be put on later.* When the adjustment is made, proceed to cast the second large side.

Ater the second side is cast, set, and fairly dry, spread newspapers to work on. Trim the edges to the line and bevel inward at about 45 deg. It is better for this beveling to be rather rough and jagged, instead of a nice, smooth, and plane surface, in order that the closing sides may make a joint that is not likely to develop a split or crack at the corner edge of the block. When through cutting, brush dust off edges, fold up papers, and dump the debris in the pail. For the casting of the third and fourth sides, corks and needles may be employed as with the larger sides; or simple wedging may be resorted to. When adjusting for the third cast, use a triangle to test the sides and bottom edges of the block, which should of course be perpendicular to the glass surface. If lubrication of the glass is found to be necessary or convenient, this should be done before final adjustment for the third and fourth sides. Soap should not be used, as there is danger of washing some of it up onto the plaster and spoiling the continuity of the joint that is to be made with the new plaster. A good lubricant can be made by melting about 1 cu.cm. of stearine wax, adding about a tablespoonful of spirits of turpentine, and diluting with about 50 cc. of alcohol; keeping the mixture warm in a water bath. Brisk rubbing with a dab of cotton moistened with this solution will coat the glass with a thin film. A simpler method is to use cotton with a small quantity of vaseline.

When the position of the frame is satisfactory, *keep hands off.* Build the clay dam around the work, moisten the beveled edges with a little water, mix plaster cream, and pour side three. The degree to which dry plaster must be moistened, in order that new plaster may stick and make a perfect continuity, can be learned only by actual practice. At first the older plaster will suck water up greedily. The proper moment is while it still draws, but has not power enough to deprive the new plaster of the moisture necessary for proper setting. In this case the exact crisis is less important than when adding a small dab of plaster to an old, dry block, as in repair work.

In pouring, use a little more plaster cream than seems sufficient for the proper minimum thickness of the side (or end of the block, if it is preferred to call

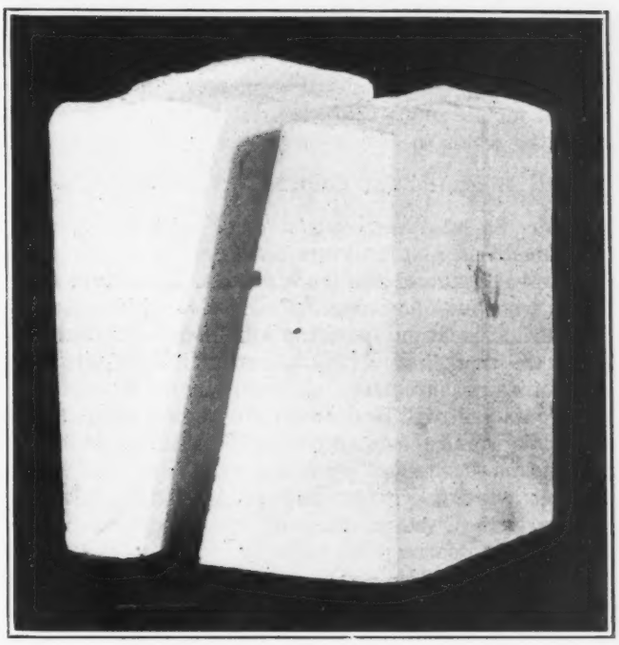


Fig. 8—A "stunt" pair of blocks, showing an imaginary mine with shaft, crosscut, and drift on an inclined ore deposit. This has been prepared for the purpose of demonstrating that the hollow-block system is not rigidly restricted to 90-deg. work.

it so), so as to have enough to muck about the corner and round it out for greater strength. When the new plaster has begun to set, and there is no danger of its meandering away, remove the clay dam and dress the outer edges with a palette knife, a tiny trowel, or with whatever tool may seem most convenient. Work enough plaster in to fill any gaps, but do not muck plaster too high up the sides, or it may cause too much trouble in shaving it off when the block dries.

When side three is set, dried, and off the glass, clean up and adjust frame for the fourth or closing side of the tube, checking up angles carefully with triangle and gaging the height with calipers to 20 cm., less paint thickness. When ready, cast the closing side of the tubular affair. Should the beginner anticipate difficulty in pouring the second and fourth sides, consider the ways of builders of concrete houses and use pasteboard or tin troughs to guide the plaster cream to the points where it is desired to place it.

When the tube has dried sufficiently for handling, mark the lower end of each side for the purpose of trimming preparatory to casting the base. This is done by any obvious method, such as by resting each side of the block successively on the glass and using a

triangle and sharp soft pencil to carry a line around the perimeter. Then spread newspapers, trim to the line, and bevel on the inner edge.

Ink in on the glass the desired outline of base, or what is practically a 10x20 cm. rectangle. Then draw another rectangle within it, of the size that you wish to make an opening in the base, through which the final pouring is to be done, as well as any future pourings prior to chipping away during a revision. A convenient size for this opening is 4x8 cm.; though 2x4 cm. or even merely 2x2 cm. may suffice. With clay, build on this inner rectangle a truncated pyramid to the height of the desired thickness of the base of the block. Place the tube on the glass, in proper alignment, and check up the perpendicularity of the sides. Build the clay dam on the outside, moisten beveled edge and fairly well up the inside walls, mix plaster, and cast. The central mound or core of clay, by almost disappearing, indicates when to stop pouring.

Modeling and Casting Top of Block

After the base has set and dried, and the clay core is cleaned out, plot a datum plane at the proper elevation on each side of the block. From the datum plane, plot the outline of surface on each side of block, deriving the information from the latest mine sections. In all of the modeling of the top of the block, strive to guide the measurements by referring to drawings or other data that will be used for any future comparisons. Use topographical contour maps as a guide, and study photographs as well if such are available; but get the sections as nearly correct as possible. If the mine sections are at 50-meter intervals, cut strips of card or thin metal to correspond. With one of the razor-blade scalpels, carve slots at the proper places on the inner edges of the sides of the blocks. Cut the lower edges of the section strips until they rest in the proper position when lowered into the slots. Then set them aside until a little later.

Build a temporary platform inside the block, supporting it by falsework from one or two of the little stulls, or by other temporary stulls wedged into place, using dabs of moistened clay wherever they seem to be needed. Fill the larger voids with blocks of wood or almost any odds and ends, setting the section strips or vertical templets in place at the most convenient time and using dabs of clay to make them stay put. Keep on adding clay until the surface is built up, and keep on using your hands and those tools that your own ingenuity can devise, until the surface is modeled to the shape it ought to be in order to give a fair representation of the ground it is supposed to represent. When the clay work is at a satisfactory stage, the next step is to cast a mold from it.

Wrap a cloth around the lower part of the block, as a sort of protecting petticoat. Above that, wind a moistened and twisted girdle of gauze to make sure that the next part of the staging will not leave home. Then massage wet clay gently around and around the block, until there is a shoulder upon which to build up a cup-shaped affair to hold the plaster mold for the surface cast. Then grease the modeled surface and the upper parts of the sides of the block, where exposed. Add a layer of vaseline to the latter, gradually increasing the thickness toward the bottom, to facilitate the removal of the mold when set. Then mix up the plaster cream, having it slightly more viscous than usual. Pour on the modeled surface, letting it ooze to the edges and watching that no bubbles form. Keep on adding cream as it approaches the setting stage, using a palette knife to "herd" the stuff and prevent it from straying beyond the clay cup. Use enough plaster to make a fairly thick mold. If too thin, it may crack later when removing or handling it. Even should that happen, it can be patched together again, provided the workman is ingenious and has by now become accustomed to the habits and vagaries of plaster when new plaster meets old plaster.

When the mold has set and dried, remove the clay and lift off the mold. It may be necessary to tap and jiggle it gently to get it started, but if instructions are followed carefully it will come off nicely. The first such mold that I made came off in about nineteen pieces, due to a lack of sufficient lubrication for clearance at the sides and also to thin plaster here and there. However, the same mold was restored and used successfully for the final cast. The other molds came off intact.

Having removed the mold, set it to one side and clean the block. Remove the clay and falsework. Cut a bevel on the inner edges of the sides, taking great care not to mar the outer edge. Take the mold and grease the interior lightly; then place it gently on the block and press it down to its proper position. Then smear a clay seal along the exposed edge and invert the block into a cloth nest prepared in some sort of a box that can be handled without much difficulty. Pour in enough water to moisten the dry plaster where the last cast is to join the block. Tilt and roll the block about until the water has splashed high enough on the sides. Mix plaster and pour, starting with thin cream to get all voids filled. Pour sufficient plaster cream to make the required thickness, and, as the plaster begins to set, muck it about as usual to make the thicker and curved shape where it meets the sides. For doing this, the 4x8-cm. opening in the base will be found better than a 2x2-cm. opening, which is little better than a peephole. When the plaster has set sufficiently, lift the block out, invert it, and remove the mold. Touch up any slight imperfections before the final hard setting of the plaster and then put the block away to dry.

Finishing the Blocks

When the block has dried thoroughly, which may require two or three days of sunny weather, give it a coating of spar varnish. When this has dried, give it a second coat of varnish or coach painter's filler. That is to say, this is done if an old model is being matched that was prepared in the same way. For a new model, use Devoe & Raynolds white shellac (or the equivalent as supplied by an equally reliable concern), which is already "cut" with a definite grade of alcohol. Thin this down, with about three parts alcohol to one part shellac; and use nothing else on the dry plaster block to prepare it for painting. Paint on a few successive coats of shellac at one-hour intervals, until the surfaces cease to absorb shellac. The next day painting or tinting can proceed.

Paint should be selected according to one's judgment. When no other paints are available, it is possible to get fair results with ordinary water colors or drawing inks, after a thorough rubbing down with pounce powder such as is used on tracing cloth. But the best results seem to be obtained with artists' oil colors, ready-mixed with linseed oil, as sold in collapsible tubes. Mix with palette knife on a regular palette or a scrap of glass until desired shade is obtained, and then thin with turpentine. As indicated in a preceding paragraph, the

best results are obtained by laying on about three coats of paint; and it is advisable to allow two days or more for drying between each coat of paint. The first coat may be put on over the entire block, using a mild buff color obtained by mixing a little yellow or sienna with zinc white. When the coats of paint have dried thoroughly, they will take Higgins' inks almost perfectly. But if an attempt is made to ink in lines with a ruling pen before the paint is ready for such work, trouble is sure to happen. The more haste, the less speed. For painting dead-black patches, ink gives better results than oil paints.

It is important not to attempt any fine detail-marking with paints, thick or thin. For lettering on the model, I know of no better practice than the use of Willson's gummed letters and figures, as supplied by the Tablet & Ticket Co. of New York City. They come in little boxes of individual letters or figures, and may be bought separately or in complete sets, in various sizes and colors. They are also quite suitable for lettering maps and tracings. To handle them requires considerable dexterity, but the results amply repay the workman for his labor.

When all the painting, inking, and labeling is complete and approved, give the entire model one or two coatings of the thinned shellac. As already indicated, if matching an old model that was coated with "dead-lac," a similar coating must be given to the new blocks before giving the entire set a shellac wash. The "dead-lac" takes longer to dry than shellac, and does not seem to thin well with alcohol, but it gives a pleasing effect and may be more durable than simple shellac will prove to be.

For blocks with the outside dimensions as first stated, a hollow-block unit with wall averaging 1 cm. thick (including the thickened and rounded corners) and with a 5-cm. base with 4x8-cm. opening and a 3-cm. top, will have an average weight of something like 8 lb. or less, as compared with 20 lb. for the solid blocks. With 5-mm. walls, a 3-cm. base, and a 2-cm. top—ample provision where the surface is not too irregular and when early revision is not contemplated—the average weight should be somewhere between 4 and 5 lb. If no other reason existed for the making of hollow-block mine models, this is certainly one that should not be negligible. If it is found necessary to ship the model to some foreign country where the tariff schedule is inflexibly so much per kilogram for such-and-such a classification, the saving may easily amount to a reduction of 25 per cent of the ultimate total cost of the model delivered at the mine.

In conclusion, it seems pertinent to remark that the best way to learn how to make a plaster model is to make one.

Norway's Largest Iron-Ore Producer Has Reverses

The Sydvaranger Co., which is one of the largest iron-ore concerns in Europe, has been compelled to suspend payment temporarily, says the *Ironmonger*, and it is likely that there will be a complete stoppage in the near future. Apart from trade depression and heavy stocks on hand, the determining factor in the company's decision has been the refusal of the Storthing to grant state support. The company exported 250,000 tons of ore during the last half-year, according to reports received.

Doctrine of Simplified Practice Succeeding

"Benjamin Franklin, 150 years ago, said: 'Beware of little expenses; a small leak will sink a great ship.' He was uttering a warning which has been ignored to an extent which is costing America fully ten billion dollars in preventable waste each year," declared Ray M. Hudson, chief of the Division of Simplified Practice, U. S. Department of Commerce, in an address to delegates to the eighth annual industrial conference at Silver Bay, Lake George, N. Y.

"Ten billion dollars," continued Mr. Hudson, "is nearly double the sum spent last year in the construction industry. It is nearly 50 per cent more than the value of our foreign trade. It is more than half of our total savings bank deposits; or more than 50 per cent of the capital invested in our railroads."

For the executive the problem of net profits is vital, and he is hit by such wastes to an amazing degree, Mr. Hudson declared. Income-tax returns for 1922 showed that the grand average of net profit on 101 billion dollars' worth of business was only 5 and 12/100 per cent. They also showed that in agriculture, mining, and quarrying, construction, general trade, and the hotel and theater field this figure of net profit ranged up from 65/100 of 1 per cent to 3 and 7/100 per cent for the last-named.

Failure to make ends meet has resulted in 90,000 business failures with liabilities of 2½ billions of dollars in the last five years. And one common cause of failures was found to be too many varieties, types, styles, grades, brands, and minor variations of commonplace commodities. "Variety creates expense—quantity creates income," is a lesson which is steadily being driven home.

Studies by the Division of Simplified Practice have shown, Mr. Hudson said, that in the average business 80 per cent of the business is done in but 20 per cent of the varieties offered; and the profits are largely absorbed by the other 80 per cent of varieties which produce only 20 per cent of the business. Elimination of such superfluous variety, Mr. Hudson pointed out, is called "simplified practice." It was to help industry do away with this drain from too many varieties of everything that Secretary Hoover set up the Division of Simplified Practice.

Gold Production of Ontario

Preliminary estimates give a total production of 696,231 oz. of gold for northern Ontario during the first six months of 1925, compared with 571,248 oz. for the corresponding period of 1924, according to the vice-consul at North Bay. It is estimated that with the output still increasing in all fields, the value of the production for the entire year will exceed $30,000,000. It is said that the output from the Kirkland Lake district is about double the rate of 1924, and the mines of the Porcupine district have shown a gain of about 17 per cent within the last year. The increase in production was caused largely by the larger output from the Hollinger mines, the Wright-Hargreaves, and the Lake Shore mines.

In May, milling was begun at the Barry-Hollinger mine, in the Boston Creek area. This enterprise, the twelfth producer of gold in the district, was handling on an average about 50 tons a day at the end of June.

The Ratio Between Phosphate Mined and Superphosphate Produced

Formulas Developed to Aid in Calculating Tonnage of Rock Required—Applicable to Other Industries

By E. Werchowsky
Leningrad, Russia

THE FOLLOWING formulas (1) and (2) were developed by the author while sampling phosphate mines and carrying out tests on preparation and mechanical treatment of phosphate rocks in Kineshma district, Province of Kostroma, in central Russia.[1] Taking for a basis of calculation the proposed output of a superphosphate plant, it is possible to calculate the required output of a mine, or of a group of mines, supplying the works with raw ore.

To produce one ton of superphosphate, about half a ton of phosphate rock and half a ton of sulphuric acid are required. When a superphosphate plant is supplied with raw ore by several mines, situated at a certain distance, some preliminary rough treatment, such as screening or hand-picking, for separation of waste, fines, and lumps, takes place at the mouth of the mine. The enriched ore is then sent to the plant. The percentage of the waste left at the mine varies as the case may be.

Let us take Q—The proposed output, in tons per day or per month, of a superphosphate plant.

P—the corresponding output, in tons per day or per month, of a mine.

If we call m—coefficient expressing the ratio between the tonnage of raw ore mined and the tonnage sent to the plant;

k—coefficient expressing the ratio between the tonnage of raw ore at the plant and the tonnage after washing and preparation;

n—coefficient expressing the ratio between the tonnage of washed phosphate rock and the tonnage of superphosphate to be produced,

Then $P = mknQ$ ..... (1)

Taking, for example, a mine where 30 per cent of screen undersize is waste and is left at the mine,

$$m = 100 \div 70 = 1.43.$$

If the recovery after washing is also 70 per cent,

$$k = 100 \div 70 = 1.43$$

Every ton of superphosphate requires about half a ton of washed ore; in other words

$$n = 0.5$$

or $P = mknQ = 0.5 \times 1.43 \times 1.43\,Q = 0.93\,Q$ .. (1a)

If we have several mines supplying the superphosphate plant in a certain proportion a_1, a_2, a_3, where

$a_1 + a_2 + a_3 = a_0$; $Q_1 = \frac{a_1}{a_0}Q$; $Q_2 = \frac{a_2}{a_0}Q$; $Q_3 = \frac{a_3}{a_0}Q$

then $P_0 = P_1 + P_2 + P_3 = m_1k_1n_1Q_1 + m_2k_2n_2Q_2 + m_3k_3n_3Q_3 =$

$$\frac{1}{a_0}\left(m_1k_1n_1a_1 + m_2k_2n_2a_2 + m_3k_3n_3a_3\right) = \frac{Q}{a_0}\Sigma mkna$$

Let us take as a numerical example the data of a group of three typical mines sampled by the author:

Name of the Mine	m	k	n	a	$P = mkna.Q$
Gorkovsky	1	2	0.5	0.27	0.27 Q
Varkhoutkinsky	1.4	1.4	0.5	0.43	0.43 Q
Tarasovsky	1.5	1.5	0.5	0.30	0.33 Q
Total	$P_0 = \frac{Q}{a_0}\Sigma mkna =$				1.03 Q(2)

If for check we calculate the value of P_0 by the formula (1), taking m, n, k for the whole group of mines, then $P_0 = mknQ = 1.25 \times 1.7 \times 0.5 = 1.06\,Q$..... (2b)

Comparing the two values of P_0 it can be seen that they are practically equal. The estimate of the tonnage of ore to be mined to satisfy the requirements of the superphosphate plant will be accurate enough if we have

$$P_0 = Q$$

or, in other words, for the particular group of three above-mentioned mines, the mining operations have to be planned so that for every ton of superphosphate produced a ton of raw ore should be extracted from the mine.

Formulas (1) and (2) may serve with corresponding modifications for similar calculations in the case of mining, dressing, and smelting copper, zinc, lead, and other ores.

[1]Excerpt from a paper "Preparation and Mechanical Treatment of Phosphate Rocks," by E. Werchowsky, pp. 80, 1924; published by "The Institute of Fertilizers," Moscow (Russia). *Transactions*, Bull. No. 22.

Nevada's Ore Production Increased

The quantity of gold, silver, copper, lead, and zinc ores treated or shipped in Nevada in 1924 amounted to 4,699,333 short tons, an increase of 344,396 short tons over the 1923 output, according to statistics compiled by Victor C. Heikes of the U. S. Bureau of Mines. The total value of the metals produced from such ore and from placer mining for 1924 was $22,799,799, a decrease of $2,240,550 from that of the previous year. The number of producing properties reporting to the Bureau of Mines for the year 1924 was 384, which compares with a total of 389 producers reporting in 1923.

The production of gold in Nevada in 1924 amounted to 217,962.56 oz., an increase of 13,669.67 oz. over the 1923 output. The 1924 silver output was 9,411,379 oz., which is a decrease of 1,203,185 oz. as compared with 1923. The recoverable copper in Nevada ores treated in 1924 amounted to 73,805,323 lb., being an increase of 6,601,041 lb. compared with 1923. Recoverable lead in ores treated in 1924 was 20,060,041 lb., an increase of 1,903,704 lb. over the 1923 figures. Recoverable zinc in ores treated in 1924 amounted to 11,002,910 lb., a decrease of 3,163,640 lb. as compared with the 1923 production.

White Pine County was by far the largest producing county of Nevada in 1924, its output amounting to 3,516,230 short tons of ore, the value of the metals being $10,555,875. Nye ranked second in the total value of metal content of ores produced, which amounted to $4,847,716. Storey, with a production valued at $2,192,021, was third. The largest gold production for 1924 is reported from Nye County, with an output of 71,152.61 oz. Nye was also the largest silver producing county, the figure being 5,029,825 oz. The great bulk of the copper production was from White Pine County, which is credited with 73,290,006 lb. of recoverable copper. Clark, with 7,764,771 lb. of recoverable lead, ranked first in this respect. Clark was also the largest zinc producer, its output of this metal being 7,909,042 lb. The largest number of producers, sixty-nine, was reported from Nye County.

Glimpses of Iron Mining Fifty Years Ago

Early Days in Michigan and Missouri as Seen in Old Reports

By Dwight E. Woodbridge
Consulting Mining Engineer, Duluth, Minn.

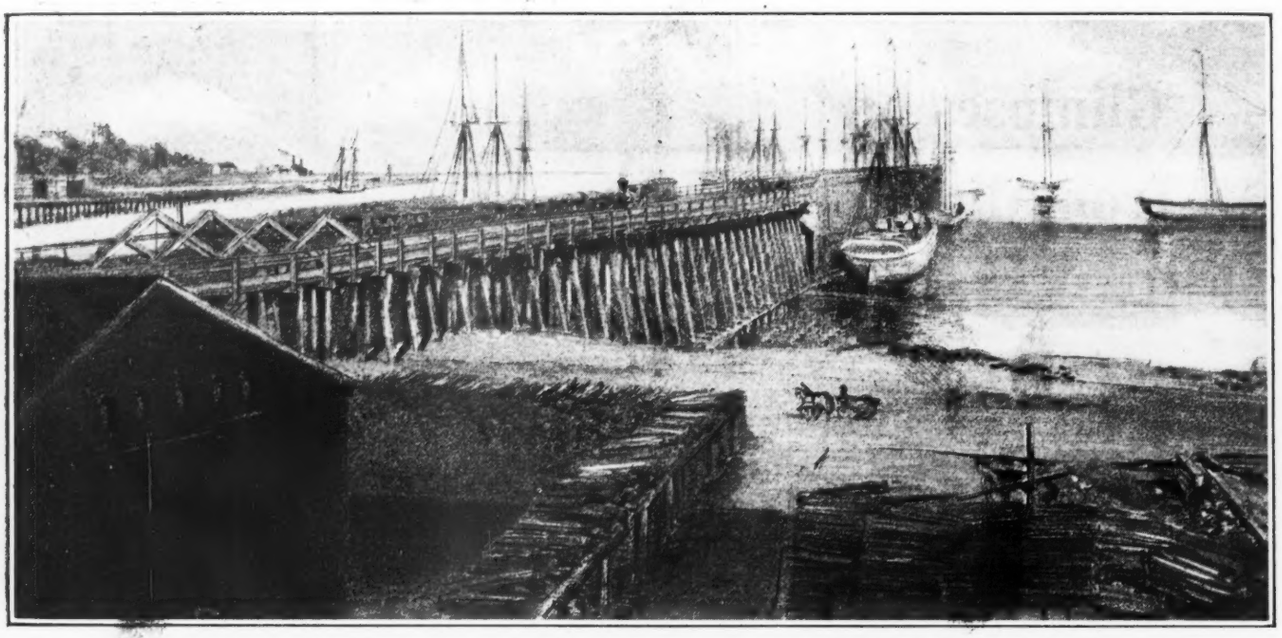
Woods traveling today has not changed from that in the early days. The photo shows the author, Dwight E. Woodbridge, carrying a pack and grub box. The canoe has just come over the portage

EVERY ENGINEER is interested in looking back over the work of his predecessors, in comparing methods and problems, in placing their predictions in line with later results, and in orienting himself in their point of view. In 1874, fifty years ago, Raphael Pumpelly, T. B. Brooks, and Adolph Schmidt collected into one volume their reports on the iron-ore districts of Missouri and Michigan. Professor Pumpelly had been director of the Geological Survey of Missouri, and was one of the world's foremost economic geologists, of that time or since, as well as one of the first men in that field. His two intensely interesting books, "Across America and Asia" and "My Reminiscences," have told the life story of a man of science and practice, one with great powers of observation and reasoning, during the period when the wildest adventure and most serious danger traveled hand in hand with technical work. Their prescribed reading would be a wise addition to the curriculum of any mining school. Mr. Schmidt was one of the "old Heidelbergers," and assistant in the Missouri survey. Dr. Brooks was State Geologist of Michigan, and his was the time when the iron and copper resources of the state were first the subject of intensive study. The death of Dr. Houghton in 1845 had stopped the earlier survey, and comparatively nothing was done until Brooks took it up again in 1868. Brooks was the author of that monumental "Report on the Geology of Michigan," in which scientific information, valuable suggestions to prospectors in that new field of work, and a most readable narrative were blended happily. It would be easy today to duplicate or expand the information that Dr. Brooks then gave; but he was charting what was an almost unknown sea, and the mere labor required to make that chart possible hardly can be appreciated by the later generation.

The districts covered by this report on Missouri and Michigan then supplied ore for two-thirds the iron product of the United States, and every deposit that had been discovered prior to 1873 is described therein. Since that day both states have declined relatively to the whole, and their combined contribution is now about 25 per cent of the total, practically all of which comes from Michigan. Missouri's output has dropped to far less than one-tenth of the American iron-ore production. So pass the wonders of the earth.

To Missouri are devoted 210 pages; Michigan is given 309. Professor Pumpelly had studied Pilot Knob with considerable care, and he remarks on the general similarity of its iron-bearing rocks to those of Lake Superior, New Jersey, and Sweden. A brief sketch of Pilot Knob may be interesting.

Beginning in 1850 and ending about 1890 the Pilot Knob mine shipped 1,500,000 tons of very high-grade specular hematite, which was made into iron locally, at St. Louis, Ohio points, and Pittsburgh. One of the last shipments was 40,000 tons to the Carnegie Brothers Company, by water up the Mississippi and Ohio. Early shipments were by ox team to the river. At one time the company employed 1,500 men in its mine and at its furnaces, and a thriving community subsisted on its activities. Except for about 300,000 tons of exceedingly rich ore in pillars in the old mine, which, in spite of reports to the contrary, are yet standing, there remains in place only such ore as is in the periphery of the openings, together with about 500,000 tons that was taken out in course of mining the high grade and that now lies about the Knob in great piles. Some of these contain up to 100,000 tons. This material assays from 35 to 55 per cent iron and is amenable to concentration. Also, there is several hundred thousand tons of residual softer ore, more or less covered by decomposed porphyry clay, that must be washed to become commercial. Explorations carried on at various times since the mine closed, the last by me two years ago, fail to reveal minable high-grade extensions of the main deposit. Nevertheless, Pilot Knob is a perfectly feasible commercial undertaking on a moderate scale, and has a near-by market. I have secured a 60 per cent concentrate from average large lots of the old dumps, and almost as good a wash concentrate from the residual ores. Unfortunately for the company, its president, O. L. Garrison, died recently. He had been brought up in the iron and coal business and had the future of this property very much at heart. He was working toward its rejuvenation.



Ore dock at Marquette, Mich., Marquette, Houghton & Ontanagon Railroad's breakwater for loading vessels. From an old lithograph

A few miles north from the Knob is Iron Mountain, at one time classed as "an inexhaustible mountain of iron ore." In the early days it shipped to various markets about 3,500,000 tons of ore, beginning in 1845. It has been an almost continuous shipper for eighty years, although for much of the time in trifling quantities. Recently a notable development has been undertaken, a plant has been built to treat the conglomerate ores in clay, and considerable shipments have been made to St. Louis. Underground work has disclosed large orebodies, statements as to the quantity of which vary but have been quite enthusiastic. Ores here lie in three distinct geological horizons: boulder ore in surface clay which at one time covered the entire area of the mountain and which during the last two or three years has been hand-mined in a small way; a conglomerate ore which resulted from the disintegration of the main bed during Pre-Cambrian time and which no doubt exists in very considerable quantity and is that now receiving chief attention; and vein ore similar to the main Pilot Knob bed, and from which both other types were derived.

Professor Pumpelly ventured no tonnage estimates in his reports on these properties; he did estimate that the Pilot Knob ore bed comprised an area of about 200,000 cu.yd. In this he was quite accurate, as the actual area of the main body is now known to have been 190,000 cu.yd.

Mr. Schmidt stated that Missouri was "one of the richest states in iron ore on the North American continent," and he listed about 280 deposits, which he said was probably a quite inadequate total. And so it was, for the number of deposits, banks, beds, and other occurrences of iron ore in the state is far higher. Most of those listed were brown ore banks in the Ozark uplift, similar to those that now are mined in northwestern Georgia, Alabama, and western Tennessee. No doubt they looked larger then than now, for the unit of comparison is different today, and it is recognized that most banks of this type are a farmer's game, wagon-box mines, not safe for elaborate equipment or preparation.

In 1873 Michigan mines were booming; they shipped 1,195,000 tons of iron ore, more than ever before and more than for any year of the next five. This product came from forty-two mines, all in the Marquette region; the Menominee was undergoing the tribulations of birth, the Gogebic was in the womb of nature. All that had been done in Michigan was the result of that memorable five tons sent down by the Jackson Iron Co. in 1850. The leaders were the Lake Superior, Cleveland, Jackson and Republic mines, which were the only producers in the 100,000-ton class. Champion followed next, with 73,000 tons. These were tremendous mines for the time, and are to be compared with today's leaders, such as Hull-Rust, Mountain Iron, Mahoning, and Fayal, which in their chief year sent down the Lakes from 7,665,000 tons from Hull-Rust to 2,289,000 tons from Fayal. In making his report Dr. Brooks worked under instructions from Alexander Winchell, brother to N. H. and uncle to Horace V., the names of all three of whom are household words in the iron ore trade, and he was "desired to produce as complete a manual as possible of information relating to the finding, extracting, transporting, and smelting of the iron ores of the Lake Superior region."

Old-Time Equipment

Those were the days of wood fuel, of hand and piston drills, of Cornish pumps, Delamater compressors, Merritt's patent internal gear and Hodge hoists, of 5- and 3-ft. drums, black powder and nitroglycerin—and of 64 to 67 per cent iron ore. Prominent scientific authorities of the time were of the opinion that the Marquette deposits were shallow, basing their predictions on what they observed at the Lake Superior and Jackson mines. How familiar that all sounds! And yet the Lake Superior still is producing, after the lapse of more than half a century and from depths to 1,248 ft. with the bottom not in sight; other mines of the district are known to have ore to 3,000 ft. or more.

In those days the one ore-shipping dock on the Lakes was at Marquette; it was 38 ft. high and had pockets

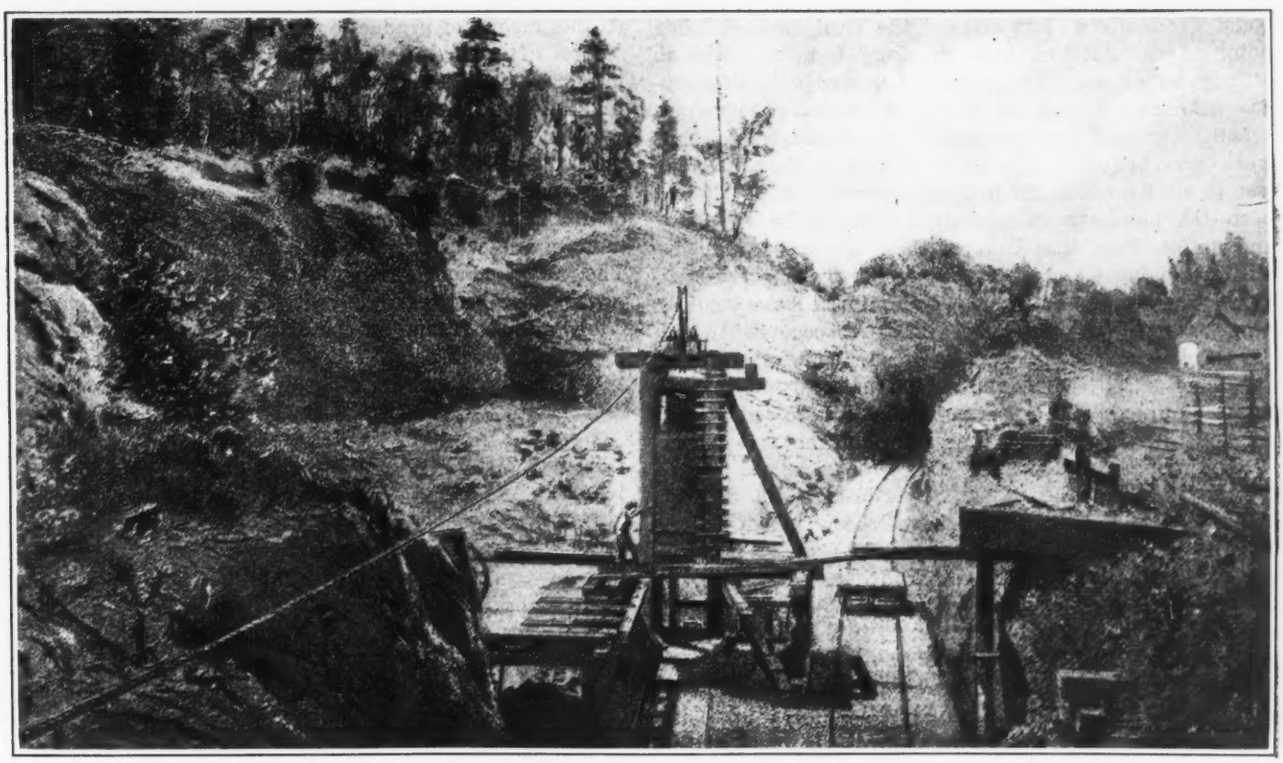
holding 55 tons of ore; ore cars held 8 tons, and ships averaged that year a capacity of 650 tons. This dock had made the prideful record of handling 6,000 tons in a single day. Now, there are twenty-three of these piers, and they are standardized—for the present—at a height of 80 ft.; the three operated by one railway have handled 216,000 tons in a single day of twenty hours; pockets have 350 tons' capacity and ore cars up to 85 tons' capacity are in use. Then, vessels of 475 tons might be loaded in seventy-five minutes; now, a 10,000-ton cargo has been put into a ship in nineteen minutes. Then, three-fourths of the ore was taken by sailing ships; now, all of it is conveyed by steam or electricity. This change is striking, but it is no more revolutionary than has taken place in all industry in the same time.

Dr. Brooks outlined the four great rock series of the Michigan region, and showed that the Huronian covered about one-eighth of the area of the upper peninsula; he stated that the several iron districts comprised about 20 per cent of the Huronian, while in only about half this latter had ores of commercial value been proven. Such an average may seem low to the layman, but probably is quite high, and it may be questioned if definitive exploration has confirmed this estimate. Outside the Huronian he did not advise prospecting, though not denying that iron might exist in other rocks of the region. It is the fact, however, that the Huronian is the only rock series in which iron ore of commercial quality and quantity has ever been found in the Lake district. He discussed topography, lithology, stratigraphy, and boulder characteristics of the region, adducing hints to prospectors therefrom. These are as apt today as when written, for the fundamentals of geological science do not change in fifty years. "A windfall," he says, "is as good in this region as $5,000 worth of testpits to the square mile." With the single exception of the Cuyuna every iron district ever discovered in the Lake region has borne out this theory. The Cuyuna, alone of all, was discovered as the result of pure science and abstract reasoning. And this distinction holds good, so far as I have observed, for any iron district in the world.

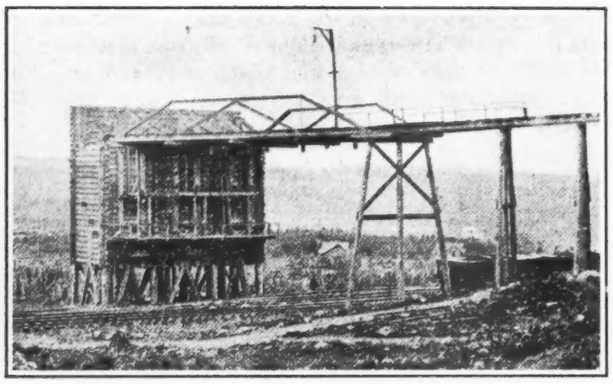
Advice to Prospectors

He calls attention to topography, the presence of certain boulders and irony sands as indications the prospector will do well to note. This is, of course, good and reasonable advice, and reminds one—because so different—of certain suggestions published in another well-known report, that of the Royal Commission in 1890. In the course of a mass of testimony it says that "frequently timber of fine growth in the iron formation indicates the presence of ore, as a good many mines have been found where the timber was straight and of good size and free from underbrush and of better quality than other trees of like sort in the vicinity. Where the timber is good and ore is found, it is generally first class, but where the timber is poor and is a mixture of scrubby wood, the ore also is likely to be of inferior quality. Invariably very fine springs have been found where iron mines of a permanent character have been located. The dipping to the north of an iron deposit is a very important feature in connection with its permanency; this northerly dip is caused by the abundance of ore in the mine and its consequent attraction toward the north pole. In some instances large deposits dip toward the south near the surface, but deeper these dip to the north, a sure indication of a large body of ore."

From my own experiences when as a lad, and since, I have traversed the northern wildernesses with a heavy pack on my back, I can guarantee the accuracy of the following remark of Dr. Brooks, and know from what depths of physical exhaustion he penned it: "Fallen



Jackson mine, looking west in No. 1 pit. One of the early developments in the Lake Superior region. From an old lithograph



An early ore pocket in the Lake Superior iron country. From an old print

timber, swamps, steep bluffs, ledges, and numerous great boulders make traveling through the Laurentian areas difficult and laborious in the highest degree. The writer believes it requires more physical exertion to travel five miles per day (all a man can accomplish with a pack) through Lake Superior granite windfall country than in any other region east of the western mountains." It is impossible for those who pass through the Lake country by automobile, over concrete roadways, stop at comfortable and even luxurious hotels, and see the attractive little cities strung along the ranges, to understand from any description, however vivid, what travel was up to, say, 1900.

Few of Marquette's Old Mines Exist Today

Speaking of the Marquette, Dr. Brooks describes the various mines, few of which are now extant. Referring to Township 47, Ranges 27, 28 and 29—Negaunee and Ishpeming are in the north part of 47-27, Lake Michigamme touches 29—he says that on the whole the ore basin gradually widens toward the west from a mere point at the Jackson mine to fully 5 miles wide at Michigamme lake. This does not accord with present-day information, and Dr. Brooks adds that the "money I had to expend was more than exhausted before this work was begun." The same difficulty then as now was to secure funds for proper scientific study. It has been the handicap to geological exploration by state and nation from that time to this. Jackson mine, instead of being an apex, is not far from the center of a roughly rectangular area of about ten square miles in which the Negaunee-Ishpeming ores occur. He did not think much of the vicinity of section 16-47-27, and this since has been determined as the western edge of this rectangle. There was no realization, at that time, nor for thirty-five years thereafter, of the persistence in depth of these deposits. Dr. Brooks calls a warning, saying that the "Lake Superior-Barnum deposit evidently has a bottom, which will be reached within a period of which it is worth while for the present generation to take some heed. So of many other mines of this region." I know of but one man now alive and active who was a factor in that generation, but the mines are bigger than ever, and those old deposits are proved as deep as 3,000 ft., and more.

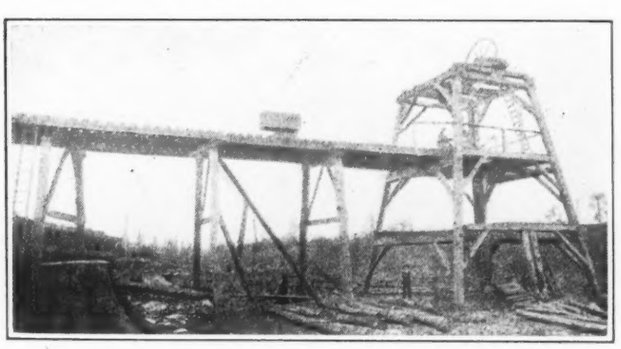
Referring to properties in the L'Anse district, Brooks calls particular attention to the presence of manganese, and says "Whether this ore, carrying manganese, would possess value in the manufacture of metallic manganese I do not know, but its presence undoubtedly gives additional value to iron ores in improving the quality of the metal produced and causing the ore to work more easily in the furnace, besides especially adapting the ore to steel manufacture." It was a long time and required much missionary work before iron masters began to recognize the value of certain manganiferous ores.

Menominee's Shipments Begin

In 1873 there were no mines on the Menominee; it was not until 1877 that shipments began. Explorations there at the date of Brooks' report were trifling. Hulst was beginning his work for the Milwaukee Iron Co. at the Quinnesec and Breen and preparing for the activities of that important concern. Most of the Survey field work had been done by Pumpelly and Credner, who had been working for the Canal company under its land grant allowances. Brooks described the probable quantity of ore as "great, and the chances for mining all that could be desired." "If the ores are of first quality this region has a future which will only be surpassed, if it is surpassed, by the Marquette, now developed so that its ores produce a fourth of all the iron made in the United States." Quality he could not test; the Breen was the only property that even had been named at that date. He calls attention to the fact that but a trifling share of iron ores ever found outcrop to a quality which digging develops, and that "soft hematite ores never outcrop," which may have seemed so then, but has been disproved often since in other formations.

Speaking of Felch mountain, he suggests that the laminæ of ore there are very rich, analyzing from 63 to 67 per cent, and that these ores are well adapted "to stamping and washing, and on account of proximity to rapids and falls of Sturgeon Falls well situated to be worked in this way, when the market drives miners to this means of production, as it will sooner or later." Years afterward both jig and magnetic separation methods were tried on the Marquette, at Negaunee, Republic, and Humboldt.

A page or two was devoted to the Gogebic, then a mere rumor to most men. "These rocks are essentially Huronian, and I know of no good reason why merchantable ores may not be found among them. No commercial ore was found either in place or in boulders. The most encouraging indications observed pointed toward the existence of soft hematites, which very likely may be found in sufficient quantity and quality to pay for working." Today, the Gogebic is developed 4,000 ft. deep and is a larger producer than either Menominee or Marquette.



The old type of shaft headframe. From an old print

Dr. Brooks sketches breezily the old-time happy-go-lucky manner of "experting" and opening mines, and analyzes the resulting failures. He follows with practical suggestions of all sorts for the prospector, even including food allowances; he gives land-office information and the like, together with a discussion on the magnetism of rocks and the use of the needle.

EARLY COSTS

There are a good many cost figures. Most of the mines were then open cuts, and of the little ore that had been produced by candle-light none had been at a profit. At that time common labor was paid $2 a day and contract miners earned up to say $90 a month. Per man per day 2.5 tons was an excellent record, in those open pits. Cornish and Irishmen constituted the bulk of mining forces; Swedes were coming in at a rate that threatened to depopulate the homeland. Now, none of those races are in evidence except as general managers and superintendents. Steam and electricity under ground are replacing even the south European digger. Brooks assumes a cost of mining for hard ores amounting to $2.65 a ton, not including royalties, overhead, interest, depreciation, and other like charges. At the time combined rail and Lake freight from Ishpeming and Negaunee to Lake Erie was about $3.50. "I do not wish to predict the exhaustion of the region; I think Marquette will produce ore as long as that article is wanted. New deposits will be found, leaner ones will be worked, and the older will be followed deeper; but this implies new mines, new locations, new railroads, new men, and more capital. What I wish to say is that if stockholders are not receiving fair interest on their investments, and, in addition, being paid back their capital at the rate of 50 to 75c. a ton, they are not doing a good business."

I wonder how many iron-mining companies making sales on the market today could show a "good business" if measured by that yardstick, in spite of their modern and labor-saving equipments, their multitudinous and carefully planned economies, and their vast tonnages?

Furnaces working on Lake ores in those days showed yields of about 64 per cent, so that their ores must have averaged fully 63 per cent iron, and in fact did so.

Welsh Nickel Industry Prosperous

Decreased imports and exports in the Welsh copper and zinc industries are recorded for the first half of 1925, and a generally prosperous condition in the nickel industry was accompanied by a slight decrease in exports of cubes and rondels, the total being 2,123 long tons, compared with 2,419 tons in the corresponding period of 1924, according to the Vice Consul at Swansea. Exports of nickel sulphate, however, increased.

The nickel-manufacturing industry of South Wales is carried on by two concerns, the Mond Nickel Co., Ltd., and the Anglo-French Nickel Co., Ltd., both located at Swansea. Both companies import raw material, chiefly matte from Canada, and produce nickel and byproducts at local works. The products are disposed of on both domestic and foreign markets, with the trade about evenly divided between the two. The largest exports were assigned to France, Germany, Japan, and Italy, but it appears probable that a good many of the shipments to France and to certain other countries were intended for trans. hipment to the United States.

Granulating and Drying Blast-Furnace Slag

Abstracts of articles, appearing in a recent issue of *Stahl und Eisen*, dealing with the subjects of granulating blast-furnace slag and of various ways of drying it, are published in the July 24 issue of the *Journal of the Society of Chemical Industry*.

In a process described by G. Hartmann, which is in use at Ilsede, the slag is granulated by falling from a height into water contained in a chamber at the base of a wooden tower, which carries away the water vaporized, containing sulphur dioxide. The product is elevated to a storage hopper, where it is discharged containing 8 to 9 per cent of moisture. The speed of the elevator and the amount of water used are regulated by the quantity of slag. The process may be modified to deal with slag from any type of furnace.

A. Koerfer describes the drying of slag on a suction drainer. The slag, granulated in water, is elevated by an air lift and distributed evenly over the suction bed. This consists of perforated metal plates through which the water is drawn, while rotating scrapers prevent clogging of the bed and deliver the material continuously into storage hoppers. The water is used again after allowing the fine sand it carries to settle out.

According to A. Liebrich, in the process in use at the Roland foundry the slag is plunged in water so that it becomes spongy in texture and is then delivered to a rapidly rotating table where it is separated from the water; a product of any desired compactness or water content can be obtained. The material possesses the same hydraulic properties as granulated slag prepared by the usual methods.

F. Schneider says that in the process used by the Gelsenkirchener Bergwerks A.-G. the slag is delivered into a specially designed mill where it is disintegrated by rotating blades in a water spray the amount of which is regulated to give a dry product. A considerable proportion of finely divided material is produced which is very suitable as a raw material for cement manufacture while the power required to grind the product is about two-thirds of that required for slag granulated by a wet process.

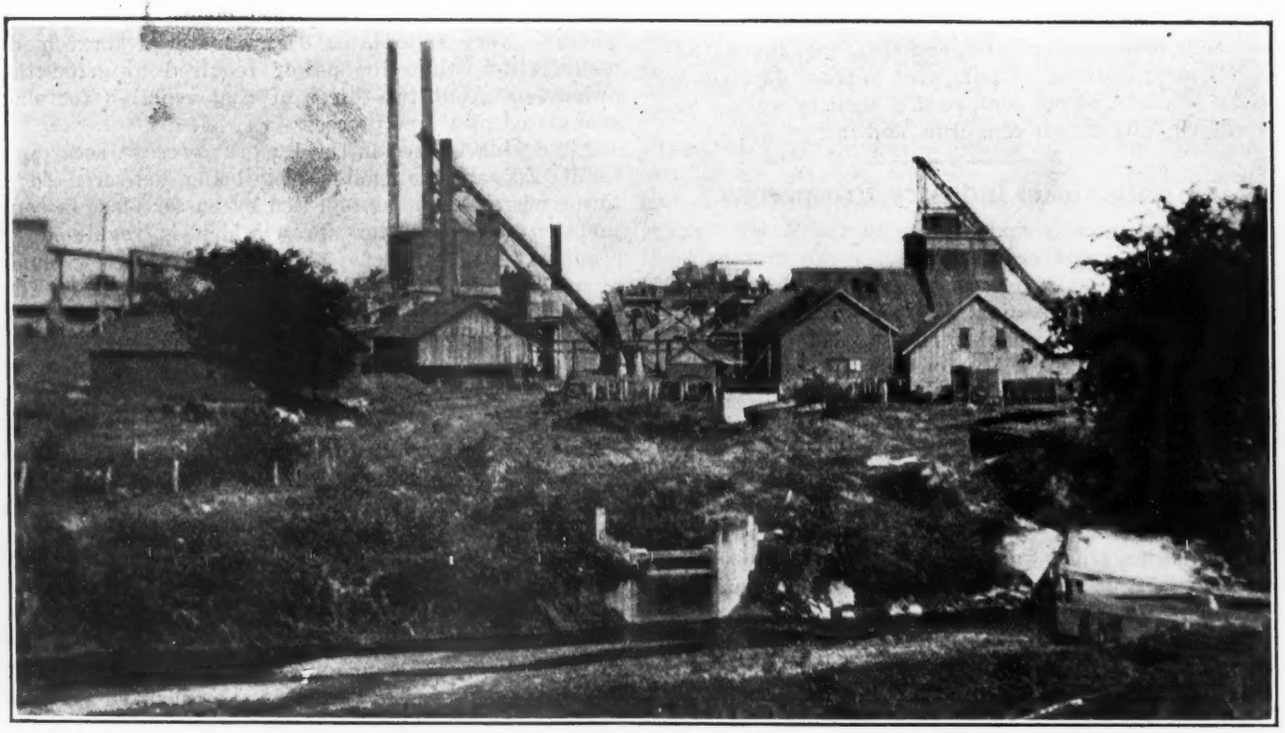
Air drying is used in the Buderus process, according to M. Zillgen, the molten slag being delivered to a tower where it is disintegrated by an air blast in conjunction with a water spray which is regulated to produce a dry product. The material passes through a screen before reaching the storage hopper. The product is at least equal to that obtained by the wet process for use in the manufacture of cement.

Australia's Bauxite Deposits

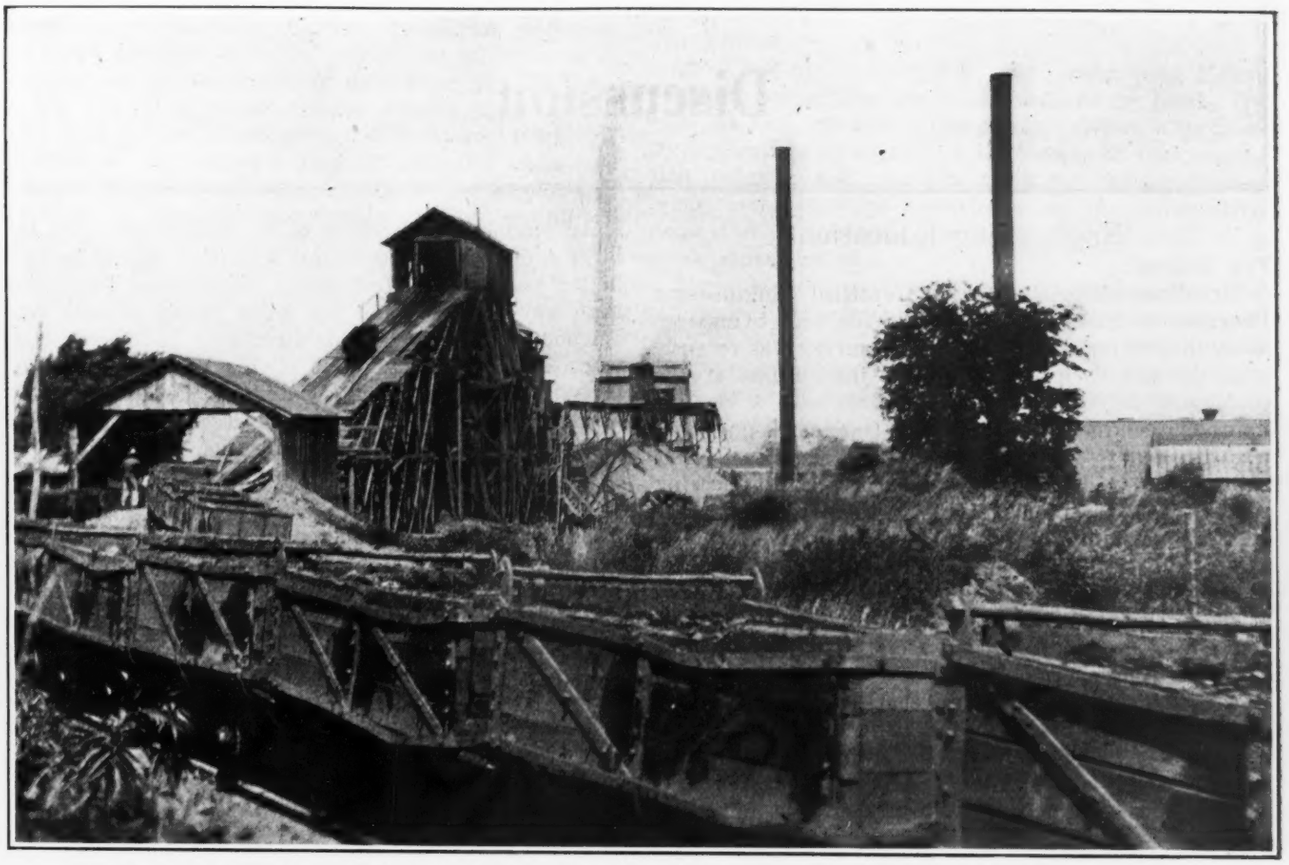
"The Commonwealth of Australia possesses vast deposits of bauxite, which hitherto have practically been unexploited," says the *Queensland Government Mining Journal*. "For this reason it is of particular interest to note that the discovery has just been officially announced in France of a process permitting the economical manufacture of aluminous cement. It is claimed the new process will make aluminous cement available for the cheapest class of building operations. The discovery was made in the Department of Herault, where the people using the product are assured of large beds of bauxites, particularly in the region of Cette."

Glimpses of the Phosphate Industry at Mount Pleasant, Tenn.

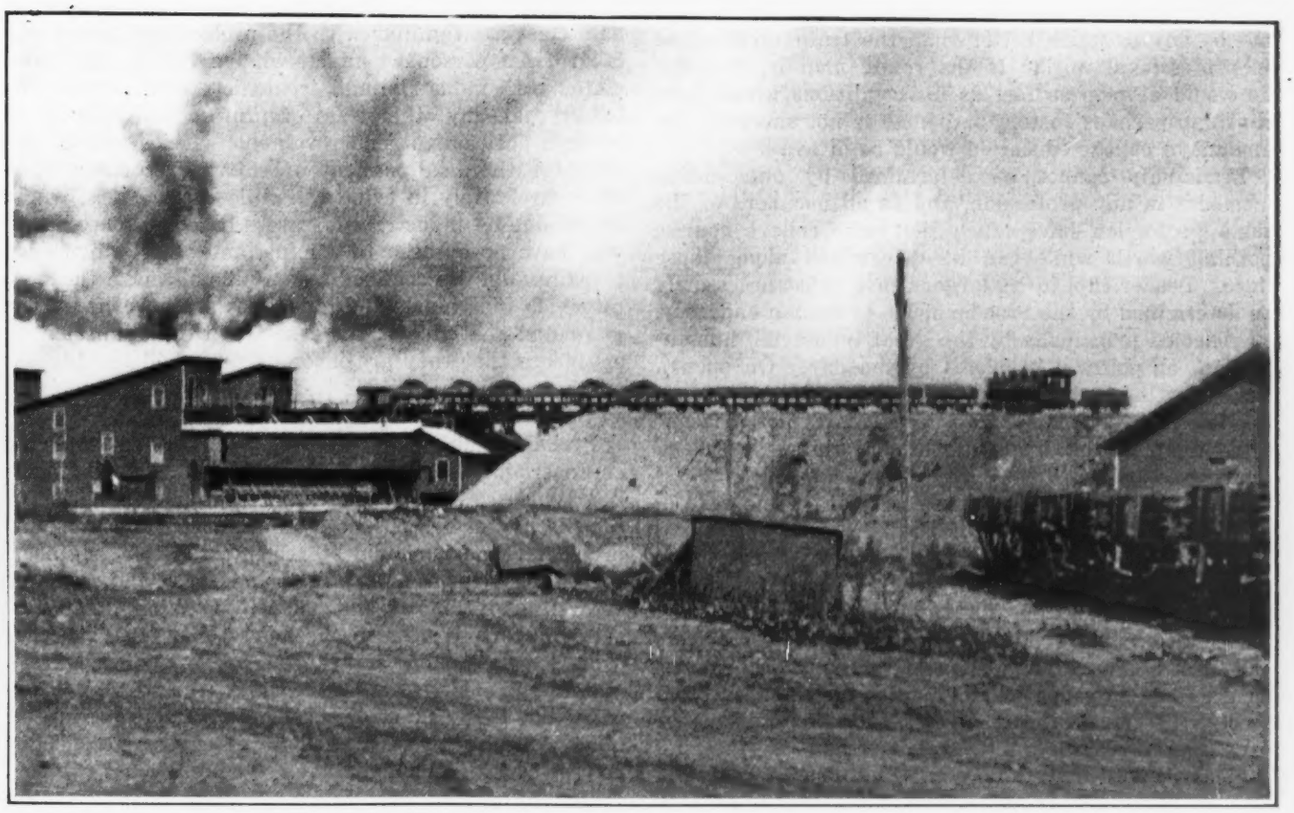
Mining brown phosphate sand and lump rock on Federal Chemical Co.'s ground. Irregularities in the limestone country rock make shoveling difficult. (See front cover)



Hoover & Mason phosphate washing plant, near Mount Pleasant



Phosphate washing plant of the International Agricultural Corporation, near Mount Pleasant



Another operator at Mount Pleasant—Washing plant of the Charleston South Carolina Mining & Manufacturing Co.

Discussion

Engineering Education

THE EDITOR:

Sir—Your editorial of Aug. 22, entitled "Engineering Program at Stanford," is well taken and brings up many interesting considerations. A survey was recently made by the various engineering institutions of the country to determine certain features with a view to improving engineering education. One of the questions was directed to the advisability of a six-year course, and another to determine whether present engineering education developed leadership. Probably both of these questions should be answered in the negative.

It costs from $1,000 to $1,500 a year, with economy, to educate a young man in one of the larger universities at the present time. This would include tuition, room, board, books, and college and social activities, and for a six-year course would amount to from $6,000 to $9,000. How many parents can afford that, especially if there are a number in the family to be educated? And engineers do not usually come from wealthy families. How long would it take such a student to pay back that amount, unassisted by fond parents or influential relatives?

It would seem that before the student would be sufficiently advanced in practice to use the highly specialized knowledge so acquired, the art would have outgrown his knowledge; and it is probable that the training acquired by the two extra years at college would not be any or much better than the training acquired in professional work. If the young man is energetic he would develop as fast as his conditions would warrant and perhaps faster; and if he is not energetic, no amount of college education would be of avail.

Leadership cannot be determined by outstanding members in any profession, and as all members of the same profession have much the same college course, nothing worth while can be determined along those lines. Leadership, in its larger sense, must necessarily be determined by the broader fields of human endeavor, as reflected principally by the great industrial, humanitarian, or political problems of the day. On such a basis, how many engineers can be classed as outstanding leaders? Probably not one. This is not pleasant to contemplate, but many unpleasant things are stern realities.

What is the reason for this condition? One reason, but not the principal one, is that the college training of the engineer is too highly specialized, and if any enlargement of the four-year course is made, it should not be in the direction of greater specialization but in the direction of the fundamentals and the liberal arts; and most students, if so inclined, can get these fundamentals after graduation. Law and arts students, on account of their interest in the broader problems of life, are more liberally trained than engineering students; and after graduation it will usually be found that an engineer has as his superior a law or an arts graduate, and sometimes a man who has no college education.

An engineer, on account of his association with the large industrial and economic activities, should be in a better position to affect public opinion and legislation than any one else, and yet he is rarely if ever conspicuous as a leader in this direction. Is it because an engineer's opinions outside of his narrow profession activities are too closely related to his job to permit much freedom of thought or expression; or is it just because he is so engrossed in rocks, slags, and compounds that he cannot see above a geological horizon; or is his vision so obscured by the smoke and fumes of power-plants, smelters, and factories that nothing else matters?

Effective leadership finds its expression mostly through legislative bodies, for, after all, the most important factors for the development of individuals, of industrial institutions, and of governments are the laws under which they exist. There are about as many lawyers in the United States as engineers, yet Congress is overwhelmingly composed of lawyers, although until recently the engineering professions were represented by one member. In a speech made in Denver some time ago by Secretary Daniels, he stated that the Presidency of the United States is rapidly becoming a lawyer's job and that lawyers should be interested in seeing that the best lawyer occupied the position.

This, for the engineers, is rather an interesting condition, and affords food for reflection. Engineers, who as a class are familiar with the problem of capital and labor from personal contact, who are intimately associated with industrial and economic problems, and who better than any other class of professional men would be in a position to render valuable service and leadership for the readjustment of shifting economic relations, are rarely in evidence, while the lawyers, whose knowledge of industries is rarely based on experience, who have never been in a mine, and whose knowledge of railroading is confined to a Pullman, make the laws by which individuals and industries are governed. The mere fact that this is the case is a tacit admission by engineers that they are incompetent to fill the highest positions for which their training and their experience fit them.

Probably the principal reason for this is that the engineers have no channel of expression. The engineering societies, which should be the proper channels for the discussion by engineers of industrial and economic problems (and it should be remembered that engineering in all its forms is as largely industrial and economic as well as technical and scientific) either tacitly or actually forbid such discussions. They may discuss profit and loss, labor and capital, bonus, strikes, unrest, and all such things as pertaining to a particular enterprise, but they cannot discuss these matters broadly or taken collectively, as applied to all enterprises. They may discuss the flea, but they must not discuss the dog.

More vital then, than any additional college training for the engineers to take their position of influence in the world for which their training and knowledge entitle

them, is an adequate channel of expression, and this channel should naturally be the engineering societies, and these societies might very profitably offer prizes to members of the engineering profession for the best papers presented on the broader aspects of the industrial and economic problems. This course might be objected to on the basis that all sorts of ideas and opinions would be advanced, and some undesirable. What of it? And who is to determine the desirability? In the mining and metallurgical field, cyaniding, flotation, sintering, hydrometallurgy, electrolysis, and a host of other things were waifs only a short time ago, and if they had been strangled in their infancy the mining industry would never have grown to its present proportions.

Lawyers occupy the position they do in public life because they discuss industrial relations and economic problems, as well as law; they discuss the dog as well as the flea, and when the engineers do this also, they will probably no longer be the tail end of the tail-enders as represented by Congress and other legislative bodies; but they will have a little more dignity, a little more respectability, and a little more influence in the leadership of the world. It is significant that the legislative, the executive, and the judiciary departments of the United States Government are overwhelmingly controlled by members of the legal profession. Engineers and educators in technical and scientific schools may well reflect on this, both in reference to its cause and its advisability. The United States Government is practically a government by lawyers, and yet engineers have the courage to talk about leadership in the bigger affairs of life! WILLIAM E. GREENAWALT.

Denver, Col.

A Tariff on Feldspar?

THE EDITOR:

Sir—In your issue of Aug. 22, on page 301, a correspondent from Rapid City, S. D., advocates the application of a tariff of $2 to $3 per ton on crude feldspar entering the United States. He remarks that because of the easy access of large quantities of Canadian spar, American owners of feldspar mines in Canada have bodily transplanted their grinding mills from Canada to the United States.

We would point out that the Americans never operated any feldspar grinding plants in Canada, and, further, that as late as 1923 the grinding capacity in the United States was at least twice the average requirements. There were twenty-five mills with a total capacity in excess of 300,000 tons per year for a normal consumption of not more than half that amount. It is, of course, to be expected that this consumption will increase gradually, and under existing conditions there will be at least a steady market for Canadian crude spars of high grade, since the high tariff on the ground material makes it impossible for our mills to compete in the United States market.

An application of even a small duty by the United States would militate against the Canadian feldspar industry. On the other hand, high-grade spars are becoming rare in the United States, and it does not appear probable that the pottery and enamel industry would sanction a high protective tariff to benefit a single state remote from centers of large consumption and whose output is admittedly of medium grade.

Toronto, Ont. A. C. YOUNG.

What Ails Prospectors and Prospecting?

THE EDITOR:

Sir—Soon forty years will have passed since I first noted the prospecting bee buzzing around my head. We have enjoyed ourselves immensely. What ails prospectors and prospecting? I have come to this conclusion, bringing with me a word or two wrung from a fairly comprehensive experience at the prospecting game and its collateral sport, leasin' or tributin', as it is sometimes called:

There is nothing the matter with prospecting that is not the matter with mining operations wherever pursued or by whom. New ore deposits are hard to find, and the difficulties attending their finding are of the same order of magnitude as those encountered in exploring old territory and old workings everywhere. In short, it costs much, whether the search for mineral be conducted by a technician or the ancient and honorable adept of romance and fiction.

Many of your correspondents seem unable to contemplate the old prospectors without his hardships, endurance, and courage. What hardship? Hardship! I have seen fishermen prospecting the North Sea for a herring or two endure as their daily portion in the midwinter murk of that unquiet puddle more downright hardship than my fellow craftsmen will ever be called upon to include in their monthly reports. I have seen scrubwomen, working day after day for a dole, couchant amid their soapsuds in the midsummer madness of a New York tenement, twist their very souls at more r.p.m. than ever spun the wheels in any old prospector's head in this continent's most scorching desert or in the face of a formidable mountain pass.

I have never tried to sell a prospect; therefore the capitalist is a stranger to me. To those engineers, and geologist or two, of note, that good fortune permitted me to meet I am indebted for many courtesies. Mainly, they were much traveled men; had seen much; knew much; were long on facts but "verra verra short of *opeenions*," as my friend Mr. Tavish would say it. If occasionally they draped me and my hopes with a wet blanket, the operation was timed to the second, accomplished with the skill that knew whereof the need. Too, they were fine "hill men," better far than the peasantry that ape their betters from the marsupial flivvers that haunt the trails and the highways of travel nowadays.

My grubstakes, so far, were saved from wages earned during the winter. That method of financing my trips into the hills secured me the freedom to choose where and how my capital should be dissipated. But it is becoming ever increasingly harder to earn even that relatively insignificant wherewithal to keep going. Employment managers of the big operators seem to have been instructed to bar from their payrolls men of my type, and for no apparent cause other than that of age. I can conceive of no reason whatever why this should be so.

Last winter, at a plant where new machinery was being emplaced and much surface work progressing on a large scale, I sought employment. I understood the work, and was strong enough and capable enough to do it. Yet I was rejected. A catechumen obviously fresh from the storied squalor of the Balkans was more successful. Truly, a day in the life of one prospector had an uncomfortable and even miserable passing.

A PROSPECTOR.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

CALIFORNIA placer mines employing nineteen dredges. Natomas has discontinued work at Oroville, but operates six dredges at Folsom.

Calumet & Hecla reopens shaft No. 15; installs electric hoists underground, repairs miners' houses, and completes extension of mine railroad.

The new Park-Utah Consolidated pays first dividend since recent reorganization. Underground developments satisfactory.

Much electrical development taking place in France, Germany and Italy wherever water power is available.

Placer mines on Hassayampa River, in Arizona, to employ modern dredges to work low-grade deposits.

Noranda Mines, Ltd., plans extensive development program at mine, and erection of smelter to handle copper-gold ore. Railroad to new property assured.

Hoover's advisory committee on Bureau of Mines meets at Salt Lake City; subcommittees appointed to work out details of reorganization.

Active competition for Joplin ores, as International Minerals and Metals Corporation enters field with representative at Webb City, Mo.

New mine tax law proposed in Mexico. President Calles in message to Congress insists that all mining properties be worked or abandoned.

Canadian-Lorrain encounters high-grade ore. International Nickel declares first dividend in five years.

Status of Gold Dredging in California

In August, 1925, nineteen gold dredges were in operation in California. Of these four are in northern California, the Lewiston Dredging Co., the Estabrook Dredging Co., and the Trinity Dredging Co., each operating a dredge in the Trinity River, and L. Gardella operating a dredge at Clear Creek.

The El Oro Dredging Co. has worked out its ground on Butte Creek near Cnico and has permanently shut down its dredge. The Natomas company has discontinued dredging operations at Oroville and has sold its No. 1 dredge to the Thurman Gold Dredging Co., which will continue the operation of this dredge. The Pacific Gas & Electric Co. is operating the dredge formerly owned by the American Gold Dredging Co., now defunct. There are thus two dredges in the Oroville district. The Natomas company is operating six dredges at its Folsom properties, and the Yuba Consolidated Gold Fields is operating six in the Hammonton area. It is expected that the Yuba will make a higher gold production in 1925 than in 1924.

Sunken Dredge to be Raised

The dredge operated at Jenny Lind by the Isabel Dredging Co. sank about the middle of August. It is probable that it will be raised and its operation continued, as the company acquired additional ground recently. At La Grange, the La Grange Gold Dredging Co. continues the operation of a gold dredge on the Tuolumne River.

Electrification Abroad

According to John D. Ryan, who recently returned from abroad, all the larger countries of Europe are carrying on big schemes of electrification. In France, Germany and Italy hydro-electric development is taking place wherever there is available power and a market for the current. The Italian railroads are being rapidly electrified. The French also are rapidly electrifying their most important lines and extensive electrification is taking place in Germany. England is somewhat behind in the electrification of its industries. It has not kept pace with the labor-saving devices of other countries, but it has begun to adopt the electric and labor-saving methods.

Homestake Mining Co. Purchases Mines in Western Idaho

Purchase of the Meadow Creek and the Antimony group of mines, in Valley County, Idaho, by the Homestake Mining Co., of Lead, S. D., is reported from Boise. L. B. Wright, chief geologist of the Homestake company, closed the negotiations. The Meadow Creek group is on Meadow Creek near its junction with the East Fork of the Salmon River about 15 miles above Yellow Pine basin, and the Antimony group is on the East Fork of the South Fork of the Salmon River, about 8 miles from Yellow Pine basin.

Calumet & Hecla to Open Shaft No. 15, Osceola Lode, Soon

Calumet & Hecla Consolidated will reopen No. 15 shaft on the Osceola lode as soon as preliminaries in connection with resumption of operations in this unit are given attention. No. 15 will employ 150 men and will return to a normal output of 1,000 tons of rock daily. Attention is now being given to needed repairs.

Announcement that No. 15 will be reopened is cheerful news to the Michigan copper district and is taken as a forerunner of more prosperous conditions for the industry. Calumet & Hecla has at all times evidenced an abiding faith in the future. Though compelled to restrict production on account of low metal prices, it has carried on a constructive program throughout the period of depression. Its constructive work has been on an immense scale and its exploratory program likewise has been extensive. Costs have been materially reduced through innovations in plant equipment and methods.

Miners' Houses Being Repaired

It is considered significant that the Calumet & Hecla is engaged in a general overhauling of its dwelling houses at Calumet, Mich., many of which have been vacant for a long time. The houses are being repaired, repainted, and redecorated, and 1,100 will be wired. At the New Allouez location, near Ahmeek, similar work is being done, and it gives a certain air of permanence with regard to the future of Calumet & Hecla.

Revival of Mining Operations in Death Valley Country

The silver and lead belt of Inyo County, Calif., is showing a pronounced mining revival with the opening of new roads and the high price commanded by lead. At the La Moine mine, on the edge of Death Valley, five leasers are working, and regular shipments of rich ore are being made to Utah smelters. The zone of activity is spreading through the Slate and Grapevine mountains, and is particularly marked around Darwin and Keeler. The Darwin smelter is being repaired. In the southern end of the county, tributary to Trona, the Engineers' Exploration, Belcher Extension and other companies are shipping and developing high-grade silver-lead ore.

Los Angeles Metal Supply Co. to Refine Copper

The Los Angeles Metal Supply Co. is erecting three steel buildings at Los Angeles, to be used as an electrolytic refinery for copper. The first unit will have a capacity of five tons per day. The plant will receive blister copper from the Republic Smelting Co. of Mexico, which will erect a smelting plant at Guaymas, Mexico. The Republic Smelting Co. is a subsidiary of the Los Angeles Metal Supply Co., which company is now engaged in the manufacture of cast-steel balls for ball-mill use.

Johns-Manville, Inc., Purchases Site for California Plant

A seventeen-acre, water-front plant site at Pittsburg, Calif., has been purchased by Johns-Manville, Inc., manufacturers of asbestos products. A plant consisting of two buildings, containing 100,000 sq.ft. of floor space, will be erected as the first unit. Brick and steel will be the structural materials. It is expected that the complete plant will entail an expenditure of $1,000,000.

California Magnesite Industry Retarded by Foreign Product

The California magnesite industry is on the whole not as prosperous as in 1924. It is now competing in Eastern markets with both Indian and Grecian caustic calcined magnesites. The competition of the Indian magnesite on the Atlantic seaboard and the interior is severe, as commerce reports indicate importations of 2,149 tons in July and 2,204 tons in June from this source. Magnesite from Greece is prepared in Belgium, Holland, and England, while Indian magnesite is shipped to New York, where it is prepared for use. Cheap ocean freight rates enable it to be landed in New York at a low price.

At Mendota, Calif., where a magnesite property is operated by C. S. Maltby, a three-mile power line has been constructed and electrical power has supplanted other forms of power. At the Red Mountain, also operated by C. S. Maltby, plans are under consideration to use electrical power instead of steam. Further exploration has resulted in the finding of additional magnesite which insures mining operations for a long period of years. The Sierra Magnesite Co. continues the operation of its Porterville plants. Alexander & Staples have installed a single vertical kiln at their magnesite deposits near Lindsay, Calif., and are in the market to supply caustic calcined.

Placer Operations on Hassayampa to Employ Modern Methods

The Hassayampa Placer Gold Mining Co. is reported to have begun work on its claims preliminary to early operations with modern dredges. Tests conducted along the Hassayampa River show that modern dredging operations in placer mining for gold in the sands of the river bed can be successfully carried on, according to the reports of the company's engineers. These tests have been made quietly for the last three years and indicate that the sands will yield from 40c. to $2 in gold per cubic yard.

For many years prior to the organization of the Placer Gold Mining Co. and the tests which it made dredge mining operations in the old placer camps along the river had been considered commercially practicable. Reports issued by the University of Arizona and the State Bureau of Mines say that in 1882 it was estimated that placer mining operations by Patrick Hamilton along the river yielded more than $1,000,000, and in 1883 more than $500,000 was taken from one acre of ground by placer mining. The Groom Creek placers have a record of more than $3,000,000, and other placers along the river have yielded equally well. It is estimated that more than $5,000,000 has been taken from the sands of the river by placer methods.

Charles M. Donohoe, of Phoenix, has advised the company, after making a number of trips over its claims, to purchase a dredge and to block-drill the 3,000 acres which it controls. The reports of the company show that in 1905 the Hassayampa was tested for placer gold from Wickenburg, Ariz., south to two miles below the Santa Fe bridge, a distance of 10 miles.

Park-Utah Pays First Dividend of $300,000

The first dividend of the Park-Utah Consolidated Mines Co., payable Oct. 1, will be 15c. a share, or $300,000, bringing total disbursements of the mines held by the corporation—the Daly-West, the Judge, the Park-Utah—up to $14,144,336.

Earnings of the company for the months of May, June, and July, after expenditures of more than $50,000 for a tramway and new compressor, averaged $170,000 a month. A $75,000 one-mile tramway between the Judge mill and the Ontario loading station will soon be completed. A new 3,000-cu.ft. compressor has been put in operation at the Daly-West shaft. This compressor will furnish air to the Daly-West, Ontario, Park-Utah, Judge, and Daly.

Mining plant, Park-Utah Consolidated Mines Co., at No. 2 drainage tunnel

Underground developments are most satisfactory, according to George W. Lambourne, president. The Central orebody opened up in the Daly-West above the 900 level several years ago has been developed 4,000 ft. without finding its eastern or its western limit. This bedded deposit, one of the most persistent in the Park City district, attains a width of 40 to 100 ft. and a thickness of 40 ft. The management computes its yield at 100 tons a linear ft. A new tunnel is being run from the Judge mine to open up the western extension of this deposit.

Utah Iron Ores Corporation Shipping 400 Tons Daily

Operations of the Utah Iron Ores Corporation on the Desert Mound estate of the Milner interests, near Cedar City, Utah, have developed a large tonnage of iron ore. The company is shipping 400 tons daily, mainly for fluxing purposes. When removal of the overburden from the lower pit has been completed, the daily shipments will be increased to 1,000 tons or more. In the upper pit steam-shovel operations have stripped a large, high-grade iron orebody.

Washington News

By Paul Wooton
Special Correspondent

Hoover's Advisory Committee Meets at Salt Lake City

Subcommittees Named to Render Detailed Reports on Activities of U. S. Bureau of Mines

As the result of the action of Secretary Hoover's advisory committee at Salt Lake City, subcommittees are engaged in an intensive study of the details of the work of the U. S. Bureau of Mines. These subcommittees will report to the full committee late in October at a meeting to be held in Pittsburgh.

By dividing the work, the members of the committee can devote their time to the activities with which they are most familiar. As it is impracticable for the full committee to have frequent meetings, this arrangement provides finished material on which it can act. The composition of the subcommittees and the subjects assigned to them are as follows: L. S. Cates and J. F. Callbreath, metallurgy and ore dressing; J. V. W. Reynders, fuel economy; H. Foster Bain and F. P. Hanaway, mining methods; D. M. Folsom, petroleum and natural gas; Mr. Bain, non-metallics; J. G. Bradley and Mr. Hanaway, safety; C. P. White and Mr. Folsom, collection and dissemination of information; Messrs. Bradley and White, economics and statistics; Messrs. Bain and White, service to the government; Messrs. Reynders and White, duplication in activities; Messrs. Cates and Callbreath, consolidation of experiment stations.

Scope of Committee's Work

The broad scope that the committee's work will cover is indicated further by the decision of the full committee at Salt Lake City to submit recommendations covering the following subjects:

The advantages and disadvantages of decreasing the number of mining experiment and field stations and concentrating the work at a few centers. To what extent should the Bureau enter the field of economic studies of the industry? Should a limit be placed on the amount of the Bureau's funds and the time of its staff which now are absorbed by service to other branches of the government? How can the pooling and redistribution of technical information be bettered? How are the "fundamental and underlying problems" of efficiency in the mining industries, on which the Bureau is required by law to do research work, to be delimited? Where should the state or the industry take up the work? In the safety work, is the correct proportion of effort being placed on the work most needed and that most likely to yield results? Is a continuance desirable of the present field work and that on permissibility? Is it desirable to cooperate with the states in the matter of furnishing technical service to the state mine inspectors? What safety instructions, demonstrations and educational work should the Bureau conduct? Should the operation of mine rescue and safety stations be turned over to the states or to the local associations of coal operators?

Though the preliminary reports made to the committee indicate that there is little duplication of work between the Bureau of Mines and the other bureaus of the Department of Commerce, the committee decided that it is advisable to make a record of the facts in that connection and to suggest methods which will guard against duplication in the future. Messrs. Bain and White were requested to submit a special recommendation as to the transfer of functions from or to other bureaus of the department.

At the Salt Lake City meeting of the committee testimony was presented on the general work of the Bureau; on non-ferrous metals; on the Salt Lake City and Reno stations; metallurgical work on Arizona copper; explosives; safety; and on iron ores.

U. S. Bureau of Mines to Test "Blue Ores" of Black Hills

The engineers of the U. S. Bureau of Mines who are planning an experimental plant to work out a milling method for "blue ores" will be given the use of the Golden Reward experimental laboratory and assay office at Deadwood, S. D. Though the Golden Reward suspended operations six years ago, its laboratory is completely equipped with instruments of precision and adequate facilities for carrying on research. This ore, found in great quantities through the northern Black Hills, has defied scores of attempts to reduce it at a profit when carrying $6 to $10 in gold. The Bureau of Mines at its laboratory at Reno, Nev., has been experimenting on the problem for the last year, and has arrived at a stage where it has been deemed advisable to establish a field station near quantities of the ore for further study. If the Bureau is successful in devising a method of working this "blue ore" the solution of the problem will mean much to the northern Black Hills.

Freight Rates Again to the Front

Former Commissioner Potter, of the U. S. Interstate Commerce Commission and one of the receivers of the Chicago, Milwaukee & St. Paul, has suggested that freight rates be advanced and that all the profit from that increase go to the weaker railroads. His reasoning is that the stronger roads, after having had a reasonable return, should contribute their excess earnings to the betterment of transportation generally. He points out that a whole tier of states in the Northwest is dependent upon the Milwaukee and that such a common carrier must be maintained.

The proposal has aroused unusual interest in Washington, as it is recognized as simply a restatement of the principle involved in the recapture clause of the transportation act, the constitutionality of which has been affirmed by the Supreme Court of the United States. Furthermore, it presents the same principle involved in the Pullman surcharge, which was so decisively upheld at the last session of Congress.

Though Mr. Potter's suggestion amounts to a tax on the public, it is pointed out that the public, in one way or other, has to pay to keep the weak roads going, and by the method suggested such properties may be maintained without paying larger profits to the strong roads. It is agreed that the last has not been heard of the Potter proposal.

Interior Department Establishes New Division to Consider Complaints

An invitation for suggestions, criticisms, and complaints regarding the varied activities of the Interior Department was extended to the public in an order issued by Secretary Work establishing a Complaint Division under the direction of the department's chief inspector. To encourage a free discussion of views by persons having business and coming into contact with the department, the order provides that every suggestion or complaint from the public is to be the subject of consideration by the Division of Inspection, brought to the personal attention of the head of the bureau involved, and to the Secretary.

Active Competition for Joplin Ores as Third Buyer Enters Field

Three companies are now in the market for Joplin-Miami zinc ores for shipment to Europe. The Hirshler Metals Co. purchased more than 16,000 tons in the last month, through E. H. Wolff, of Joplin. The Associated Metals & Minerals Co. purchased several thousand tons. The International Minerals and Metals Corporation, with a representative at Webb City, Mo., has recently entered into competition with the other firms for the ore. This assures a good market for Joplin zinc.

Anna Beaver Mill Makes Record for Joplin District

Records for production of lead concentrate by a single mill in the Joplin-Miami district were broken in August, when the Anna Beaver Mining Co. produced 1,060 tons of dry lead concentrate at its concentrator north of Cardin, Okla. At current prices this would be worth approximately $130,000, which is also believed to be a record for the field. The Anna Beaver has been a good lead producer for several months, its output being only slightly less in July than in August. Lee Filius is district manager.

Renewed Activity at Galena, Kan.

There is renewed activity in the veteran zinc and lead field near Galena, Kan., in the Joplin-Miami district. The D. A. Mining Co. has announced it will build a mill on the Wyandotte L. & Z. Co.'s land, southwest of Galena. The company has sixty acres under lease and has been carrying on an extensive drilling campaign. The McKinney-Schellack Co., which has been operating a small custom mill at Empire, just north of Galena, is abandoning custom work to take care of production from its lease.

Calumet & Hecla Installs Electric Hoists—Mine Railroad Completed

Electric hoists will be adopted by Calumet & Hecla Consolidated, in the Michigan copper district, to raise rock to the 81st level haulageway from levels below in the conglomerate department. A contract has been awarded to the Allis-Chalmers Manufacturing Co. for two complete, single-drum, 6-ft.-diameter hoists, together with electric equipment necessary for their operation. The hoists will be installed in the Hecla branch where levels are now being opened below the haulage tunnel. Rock will be transported through the tunnel in electric trams to the Red Jacket shaft for hoisting to surface. The new hoists and equipment will be especially adapted to the conditions at depth where there is considerable moisture to contend with.

The company's new railroad connecting the Ahmeek mine and stamp mill in the Michigan copper district, a distance of approximately ten miles, is now in operation. The new route considerably shortens the haul and provides an easier grade. In addition, ownership has been acquired to yard tracks connecting the several Kearsage lode shafts with the main line of the Mineral Range railroad. Trains will move over the main line on a rental basis. The company's railroad between mine and mill will effect notable economies in the transportation of copper rock, coal, and supplies, and will be an important factor in the further development of the Kearsarge lode properties.

A total of 6,256,000 lb. of refined copper was shipped out of the Michigan district by boat in August. Calumet & Hecla Consolidated shipped 4,324,000 lb.; Quincy, 594,000; and 1,338,000 left the docks of the Michigan smelter which treats Copper Range and Mohawk mineral. In addition, approximately 1,500,000 lb. went forward by rail to Mid-West points. August shipments were considerably less than the total for July, when 10,576,000 lb. was moved by water, but normal for August as compared with a year ago, when 6,490,000 lb. was shipped.

Nevada Gold Development Co. to Work Wilson Placers

The Nevada Gold Development Co., which was organized to handle the Tom "Dry Wash" Wilson placer properties in the Round Mountain mining district, Nevada, is reported to be well financed and ready for an active campaign of development and operation. Camp and office buildings, bins, and other necessary structures are now being built on the property, hoisting and compressor machinery has been ordered, and it is estimated that actual mining should start in the latter part of October.

The company is capitalized for 400,000 shares of $5 par value. John G. Kirchen, general manager of the Tonopah Extension Mining Co., is president, and Fred L. Cole, manager of the reorganized Montana Tonopah, is secretary and treasurer. The Schwab and Cole interests are reported to be back of the enterprise.

The property includes a large and only partly developed area of gravel about 60 ft. thick, which preliminary work indicated will average $2 per yard. The gravel is covered by from 100 to 200 ft. of barren, gravel overburden. The method of mining and the scale of operations cannot be determined until the gravel has been thoroughly prospected and its extent determined.

Contract Labor at Michigan Copper Mines

The introduction of the contract system for miners and trammers in Michigan copper mines seems to have definitely settled whatever dissatisfaction may have existed over wages. Efficient underground men now earn as high as $12 per day. The manual labor element has largely disappeared in tramming, since electric locomotives and automatic shovels do practically all of the menial work. Despite high wages paid by the producing mines, the small properties have no difficulty in keeping their forces up to standard. Recently a number of Illinois coal miners came to the copper region, where they readily found employment. Northern Minnesota iron miners also are coming to Michigan, so that the labor situation is better than at any time in three years.

Mines Development Co. Completes Cyanide Plant

A New Gold-Silver Strike Near Bucks Peak

The Mines Development Co., which holds a lease on the Buffalo Valley mine, 18 miles south of Valmy station, on the S. P. railroad between Palisade and Battle Mountain, Nev., has completed construction on its ten-ton cyanide plant. The plant has been given a trial run and operates successfully. The company has, during the last six months, shipped 268 tons of ore to smelters. Receipts from these shipments totaled $15,741, of which $14,596 was for gold. Mine development will be continued during the fall and winter.

A new gold-silver strike has been made by John Workman near Bucks Peak, 18 miles from Battle Mountain, Nev. The strike has been examined by N. H. Getchell, manager of the Betty O'Neal mine, and he has pronounced it a very likely looking prospect. Samples taken have assayed from 20 to 98 oz. gold and from 50 to 750 oz. silver per ton.

Heavy Rains Cause Suspension at Great Western Mine

Operations have been temporarily suspended at the Great Western mine, in Lower Rochester, Nev., due to damage caused by successive cloudbursts. The management has decided to wait until the cloudburst season is over before again cleaning out tanks, as of late about the time damage from one storm was repaired and operations were resumed another would duplicate the trouble. The Great Western is a small gold mine.

Los Angeles Capital to Develop Lead-Silver Property East of Cananea

Announcement was recently made that the Sonora Development Co., which is controlled by Los Angeles capital, will develop the Nevada mine group, in the Ajo Mountains, 28 miles east of Cananea, Sonora, Mexico. Because of the great number of applicants who desired to file on this group of claims, the Mexican Government decided to hold a drawing, which resulted in the Sonora Development Co. securing the right to work the property. Mining men from all over the United States and Mexico to the number of eighty-five were present at the drawing. The property is said to be rich in lead, silver, and gold, and is within 28 miles of a railroad. The company above named is controlled by Charles McKinnis, George H. Wyman, Jr., Frank M. Wyman, A. A. Carson, and George H. Carson, all of Los Angeles.

Opal Mining Now Under Way in Nevada

Valuable opals are now being produced by the Rainbow Ridge Mining Co., near Virgin Creek, in northern Humboldt County, Nev., 35 miles southwest of Denio, from a flat sedimentary formation 40 or 50 ft. below the surface. Mining is conducted through tunnels and no powder is used, the soft rock being broken with picks so as to avoid damage to the larger stones. The ore is hand-sorted in the mine and again on the dumps at the tunnel portals.

The opals are packed in a dry clay and stored in a sealed part of the mine for a period of from two to three years, to prevent too rapid evaporation of the moisture, otherwise the stones check and develop flaws. They are then sent to the lapidary to be cut in the usual round or oval forms. The company has secured a number of valuable stones, one of which is said to be worth $100,000.

Bruneau Mining Co. Building Mill at Rowland—Treasure Hill District Active

A 30-ton concentrator is being built by the Bruneau Mining Co. on its property on the Bruneau River, two miles south of Rowland, Elko County, Nev. Plans are being made to continue work throughout the winter. Cabins will be built for miners, and also a blacksmith shop and an assay office.

Diamond-drilling operations have been started by the Russo-Asiatic company at Hamilton, White Pine County. The Tonopah Development Co. is sinking a shaft on the Nevada Lead property with a view of exploring at depth certain promising showings of ore. Ore is being shipped by Ed. Wilson and associates from the Rocco Homestake mine. The Peer Consolidated mine, from which $30,000 of lead ore has been shipped, is being developed under the management of L. F. Peer. A 2-ft. vein assaying $76 a ton in silver-lead-copper has been exposed.

Noranda Mines, Ltd., Plans Extensive Development Program

The election of P. A. Rockefeller, W. D. Baldwin, chairman of the board of directors of the Otis Elevator Co., and Irving W. Bonbright as additions to the directorate of Noranda Mines, Ltd., at a meeting of shareholders held in Toronto on Sept. 8, calls attention to this exploration company and its new and potentially important Horne gold and copper mine that has been under quiet development for several years in Rouyn Township, in the northwestern part of Quebec, Canada. Other directors of this company are Harry G. Haskell, Thomas L. Chadbourne, James Y. Murdoch, S. C. Thomson, and H. W. Chadbourne. The two men last named, both mining engineers, are the managing directors and the organizers of this exploration company.

The company is an Ontario corporation, with an authorized capital of $2,000,000, divided into 20,000 shares of $100 par value each. There is now issued and outstanding 14,220 shares, and the company has about $500,000 in its treasury. Shares have recently changed hands in the outside market at $520 a share, putting a valuation of $7,394,400 on the property. The shares are not listed and are closely held, largely in New York.

It is understood that the increase in the board is a preliminary step to financing the immediate erection of a smelting plant at the Horne mine to treat the ores of this mine and to do custom smelting in the new Rouyn district, which is fast becoming a new and important copper camp.

The development of the Noranda-Horne mine during the last two years has been one of the sensations of the Canadian mining world, and is the subject of almost daily comment in Toronto and Montreal newspapers. Because of the closely held ownership of the stock, there has been no publicity.

Typical prospector's camp in Quebec's new gold-copper area

From the 1924 annual report of the company it appears that 611,500 tons of ore was estimated at that time as developed and indicated, largely above the 106-ft. level. An extraordinary feature of this mine is the richness of the ore, the average values given for the above-named tonnage being $5.57 in gold and 5.66 per cent copper. Such ore as this indicates a low cost for copper production, as the gold values would go far toward paying for the copper.

No official estimates of additional tonnage developed since the last annual report have been announced. No. 1 shaft has been sunk to 300 ft., and development is in progress on three levels. At No. 2 shaft, 1,100 ft. northwest of No. 1, development is being extended on the first level.

From statements made at various times by the managing directors and published in the Canadian press, it appears that underground development has fully confirmed preliminary estimates, which were based partly on diamond drilling, and that openings below the first level have greatly increased the ore reserves. Extension of the ore zone to at least a vertical depth of 720 ft. has been proven by diamond drilling. A new orebody was recently cut in a first level crosscut, showing an average value of $44.34 in gold per ton across a width of 20 ft. The "E" orebody, previously believed to be of medium grade, was recently cut at the first level and shows a width of 50 ft., with average content of $3.50 in gold and 12 per cent copper. On the third level crosscutting is now in progress to cut four different orebodies encountered in drilling.

No. 1 shaft, Horne mine, Noranda Mines, Ltd., July 30, 1925

Railroad Assured and Smelter Site Granted

Arrangements were recently completed with the Canadian Government and the Canadian National Railways for the building of a branch railway line from O'Brien, on the Transcontinental Line, to the Horne mine, a distance of 44.7 miles. The road is to be completed by the fall of 1926. A smelter site, near the Horne mine, has been granted to Noranda Mines by the Quebec government.

The history of Noranda Mines, Ltd., is an interesting one, as this company is responsible for the development of the Horne mine, as well as the opening up of a new mining district, which in 1922 was virtually a trackless wilderness. The same transportation difficulties exist to day, and the mine development has been attended with all the troubles of a wilderness operation. The camp as it now appears, however, with its large clearings in the forest and substantial group of buildings and bustling activity, shows how quickly the forces of nature are overcome by man.

The discovery and development of the Horne mine has extended the mining fields of northern Canada another 50 miles to the east. With the coming of the railway in 1926, and the building of a smelter, the romance will be gone.

Canadian Lorrain Encounters High-Grade Ore

Dividends and Activities of Other Canadian Mines

The most important development in Ontario mining circles for some time has been the sudden change of form of orebody in the Canadian Lorrain property, in Gowganda. On this property, which is controlled by the Huronian Belt Co., an English organization, a shaft was sunk to a depth of 350 ft. to explore the main vein. Several shoots of ore of milling grade were discovered. Branching off from this main break were a number of smaller veins, which did not carry ore at the junction. The management was getting somewhat discouraged, but it was decided to drift on some of the branch fractures. On the most important of these a drift has been run 63 ft. A short distance from the main vein ore was encountered, and for 38 ft. an average of 470 oz. over a width of 8 in. was obtained. The remainder of the 63 ft. averages over 5,000 oz. over 4½ in. in width.

There is every reason for believing that other branch veins will carry important quantities of silver and that the property will shortly develop into a substantial producer.

Castle-Trethewey Has Prosperous Year

The annual report of the Castle-Trethewey mine, of Gowganda, for the year ended June 30, shows that for the period a total of 30,273 tons of ore was milled and the total production amounted to 927,088 oz. of silver and 29,149 lb. of cobalt. The total revenue from all sources was $627,712. During the year the company redeemed its preferred stock issue of $200,000 and liquidated its $53,000 indebtedness to the Castle Mining Co. Several new oreshoots were discovered during the year, and since the completion of the fiscal period other new discoveries have been made on the surface.

Dome Mines Declares Regular Dividend of 50c.

The directors of the Dome Mines, of Porcupine, have declared the regular quarterly dividend of 50c. a share payable on October 20. A number of rumors have been current lately regarding the opening up of high-grade ore on the fourteenth level of the Keewatin. It is understood that there has been no particular change, but development on the whole has been very satisfactory and the mine is gradually working into a much better position.

International Nickel Declares Dividend

The International Nickel Co. has declared a dividend of 50c. a share, payable Sept. 20. Though it is not so stated by the directors, it is understood that this will be the regular quarterly dividend, which is the first declaration for five years. It marks the new status in the nickel industry, which provides one of the romances of Canadian mining. Following the war, the market practically disappeared, and the International Nickel Co. was faced with the alternative of enlarging its market or cutting down its operations to meet the decreased demand, which would have made it a comparatively small and unimportant concern. Large sums of money were spent in research work and advertising, with the result that hundreds of new uses have been developed and the company is now exceeding its pre-war capacity, with the probability that within a few years it will exceed the peak of its war output. Earnings are understood to be at the rate of between five and six million dollars a year, or approximately 11 per cent on the common stock, after the payment of the preferred dividend.

Geological Map of Red Lake Area, Ontario, Available

Prospectors intending to enter the Red Lake area, Patricia, Ontario, Canada, where according to press reports important discoveries have been made, can obtain a geological map of Red Lake and of the route from Hudson or Sioux Lookout on the Canadian National Railway by applying to the Director of the Geological Survey, Ottawa, Canada.

No official examination has been made of the mineral deposits discovered this year, but the following paragraph taken from a report by E. L. Bruce, published by the Canadian Department of Mines in 1924, may be of interest:

"During the summer of 1922, prospectors from Winnipeg came to Red Lake by way of Rice Lake. They located claims near the entrance to East Bay, where they found a vein of silver-bearing galena. Unfortunately . . . the impression got abroad that it was of the Cobalt type, with native silver and some of the minerals commonly associated with silver at Cobalt. As a result, several parties went to Red Lake during the latter part of the season, and many claims were staked along the shores. Most of these were not prospected at all, but the members of one party recognizing that the geological succession was more favorable for gold than silver, made a search for quartz veins, and were successful in locating some veins that contain gold in visible quantities."

Increase in Number of Mining Claims Filed in Mexico

Government mining agencies in the states of Zacatecas, Coahuila, Durango, and Chihuahua report a large increase in the number of claims filed upon during the last few weeks as compared with any similar period for several years. It is stated, however, that comparatively few Americans are taking up claims, and that but little foreign capital is being put into the mining industry in Mexico at this time.

Amatlan Mining Co. Installs Additional Equipment

At the annual meeting of the Amatlan Mining Co. of Zacatecas, held a few days ago, it was decided to install additional machinery and equipment with the view of increasing the production of ore. The property, which is situated at Chalchihuites, State of Zacatecas, is in good financial condition and its silver output is shipped to Europe. Allison W. Smith was elected president.

Buenos Aires Letter

By Mark R. Lamb

Government Attempting to Establish an Iron Industry

First Reverberatory Lead Furnace Started

Buenos Aires, Aug. 27—The Argentinean Minister of War, General Justo, has engaged iron mining and reduction specialists to make a thorough study of the iron industry as a preliminary looking to the possibility of producing iron in this country. The Bank of the Nation has had a report made on the Famatina mine, by an American engineer, who said that $6,000,000 (U. S. currency) would be required to put the mine in a condition to produce ore and for a concentration plant to treat the ore. The bank officials are reported to have been astonished at this figure and have advanced $200,000 for developing a small lead prospect belonging to the same company. Meantime, all bills for labor and materials of the defunct company remain unpaid.

All sulphuric acid in this country is made from Louisiana sulphur. There are deposits of sulphur in Mendoza and San Juan, but it is doubtful if these will be able to compete with Louisiana, on account of the high freight rates.

The New York Steel Exchange, Inc., is erecting a series of chemical plants in Buenos Aires, the commercial justification for which is the recent 60 per cent increase in duties. The Argentine now offers a good field for industries based on cane sugar and molasses, potatoes, peanuts, linseed, skimmed milk, packing-house products, and other agricultural and cattle products. Much casein is produced, last year's output reaching 14,000 tons.

The first reverberatory smelting of lead was started last week in Cordoba. High-grade galena concentrate is roasted and reduced with wood fuel, one man being capable of producing a ton of pig lead in ten hours with a ton of cordwood worth $2. As there are no customs smelters which will pay for silver, this type of furnace is suggested where fuel and labor are cheap and freight and silver content high, and specially where, as here, lead pays a high import duty. The lead produced at this mine carries 7 kg. of silver per metric ton.

Mining Industry Under Ministry of Agriculture

The mining industry in the Argentine is partly under the Ministry of Agriculture. For this reason, Dr. Thomas LeBreton, Minister of Agriculture, was instrumental in contracting for the refinery which is being built at La Plata. Because of political differences, Dr. LeBreton has tendered his resignation, leaving his proposed refinery uncompleted. It is possible that the retirement of the minister may be delayed until the refinery is completed. All oil interests are hoping for the immediate disappearance of the minister, on account of his attitude towards wildcatting. No drilling permits have been granted since he took office.

Mexico City Letter

By W. L. Vail

Special Correspondent

President Calles Insists That Mining Properties Must Be Worked or Abandoned

Mexico City, Sept. 5—President Calles, in his recent message to Congress, laid stress on the present attitude of the government toward forcing mine owners to work their properties or abandon them. A large part of the mining properties outside protected districts have been idle during the fifteen years of revolution. At many it has been physically impossible for the owners to operate because of civil disorders, lack of protection, breaking up of transportation facilities, or exorbitant traffic rates. The president apparently thinks these conditions have passed, or, at least, that conditions have so improved as to warrant the government's insistance that development proceed and as one proof of the government's contention he points out that the mineral output this year will exceed last year's output by more than 4,000,000 pesos. The president also recommends a more strict compliance with the laws looking toward a reduction of accidents and better hygienic conditions. Carrying out the policy of the government, several thousand mining titles have been declared forfeited within the last year and subject to re-denouncement. It is understood, however, that in the future, the government will require some tangible evidence that persons or companies denouncing mines are prepared financially to develop them. During the last year 2,176 new mining patents have been issued, being a larger number than were issued in the previous fourteen years of more or less revolutionary activity.

Increase in Freight Rates Decreases Zinc Production—New Mining Regions Opened

Zinc miners are much exercised because of an increase of railway tariffs amounting to from 25 to 33 per cent advance over the old rate. As all the zinc-ore production in Mexico is purchased for shipment to Europe and must stand transportation over long distances, heavy port dues at Tampico and maritime charges, zinc-mine owners insist that if the new tariff is persisted in all the mines now in operation, without exception, will be compelled to suspend. The Confederated Chambers of Commerce and the Chamber of Mines for the republic have made strong protest to the government.

The mining department has sent out special notices to the various companies, calling their attention to the fact that the office of the register of mining companies has been opened and that all companies are required under penalty of a heavy fine to comply with the regulations. The intention of these requirements is to obtain for the government ample details as to what each operator is doing, a certified copy of all mining titles to begin with, class of ores, extent of development, evidence of compliance with the various regulations regarding safety and hygiene, and other details. In the event of legal changes in the organization of the company, advice of the changes must at once be sent to the department. The data, when received and complied by the department, will be published in the official daily government organ in the City of Mexico and the official mining organ, published in the same city.

New Mine Tax Law Proposed—Present Taxes Burdensome

The new law governing mining taxes, proposed by the Department of Commerce, Industry and Labor, has been submitted to the Mining Chamber, composed of mine operators throughout the republic, for their criticism or suggestions. It will probably not be promulgated till the first of the year.

United States Commercial Attaché Dye recently submitted to the United States Government a tabulated report, showing in detail the special taxes paid on gold- and silver-mining properties in April this year. This report shows, in part:

On surface land: 14 pesos per thousand yearly, plus 15 per cent for public education; 25 per cent federal tax on first two, plus 10 per cent of this 25 per cent for the public debt.

On machinery: 5 pesos per thousand per year. No additional.

Stamp tax on sales: One-half of 1 per cent on value of invoice plus 10 per cent of the one-half of 1 per cent for public education.

Federal tax on water: 104.86 pesos every six months plus 10 per cent of that amount for the public debt.

Mining tax: 1 to 5 pertenencias (2.47 acres), 6 pesos per pertenencia; 6 to 50 pertenencias, 9 pesos per pertenencia; 51 to 100 pertenencias, 12 pesos per pertenencia; 101 or more pertenencias, 18 pesos per pertenencia. In all cases, 10 per cent additional for the public debt.

Tax on ore production: On gold, 7 per cent of value, plus 0.3 per cent for coinage. Additional 10 per cent of previous two for the public debt. On silver, 5.5 per cent of gross value plus 10 per cent for the public debt.

State tax on production: On value of bars, 2 per cent, and nothing additional.

Federal tax on concentrate: On gold, 8 per cent plus 10 per cent of that for the public debt. On silver, 6 per cent, plus 10 per cent for the public debt.

To the above must be added, of course, the income tax.

"It should be noted," says Mr. Dye, "that the tax on the production of ores is really heavier than the schedule indicates, for the reason that the tax is levied on the basis of the price of metal in New York. On most metals the price is fixed monthly, but the price of silver is fixed daily. Furthermore, the state taxes, in some states, are higher than here given."

From a study of data furnished by the principal mining companies operating in Mexico it appears that not less than 65 per cent of the net profits is paid out as taxes. Stated in another way, the reports show that the taxes run from 12 to 15 per cent of the value of the ores as produced, not considering the income tax.

London Letter

By W. A. Doman

Special Correspondent

London, Aug. 31—The effects of immense reserves of ore have been seen in more than one direction of late. A mine that is developed years ahead of mill requirements naturally gives certain persons opportunities of dealing in shares, or of circulating reports, for in connection with mining nothing is sacred—or secret. Van Ryn Deep, a good mine and with substantial reserves of ore, has been talked about in a mild way, because recent exposures in certain parts of the property are below the values to which the market has become accustomed. Down go the shares of course; someone turns them out, though there will be a long lapse of time before a lower grade of ore need be drawn upon. And such variations are frequent everywhere. On the other hand, a "private cable" from Johannesburg reports that the tonnage developed in the last few months in the Springs Mines is estimated at between 750,000 and 1,000,000 tons. The value is said to exceed 8 dwt. over a satisfactory stoping width. New Modderfontein is said to have opened up 2,200,000 tons of 8½-dwt. ore during its last working year.

In Rhodesia, attention is being mainly paid to Bwana M'Kubwa, Rhodesia Broken Hill, Rhodesia Copper, and Rhodesia Congo Border Concessions.

The Union Minière du Haut-Katanga, which is working in the direction of enlarging its output—it is now at the rate of over 100,000 tons yearly—has arranged to ship 3,000 tons of copper monthly from Port Elizabeth, owing to the lack of facilities at Beira. Beira is making headway, it is true, but progress is not sufficient to meet the requirements of the great hinterland. In about three years the Union Minière expects to have the Benguella railway completed and in working order.

Shareholders in the Colombian Mining & Exploration Co. are in considerable doubt as to their position. A valuation of £2,641,810 has been placed upon the property by the Colombian Government. Before the official announcement was made a leakage evidently occurred, and the shares, which were not wanted at 1s. 3d., rose to over 6s. The suggestion, or inference, was that the authorities were prepared to pay the amount named. Seeing how the valuation has been taken, the government has cabled that the amount it will have to pay to the company is "greatly inferior" to that named. There is talk of litigation, so there is no need to do more than draw conclusions.

Trouble in one direction does not always prevent enterprise in another. A company with the name of Carmen Valley Gold Mines has been formed with a capital of £200,000 to acquire property in Colombia or elsewhere. John Waddington, of Western Australian gold-mining fame, is a director, and another is E. T. McCarthy, who is consulting engineer to Lyndhurst Deep (West Africa) and also to a Malayan tin mine.

Men You Should Know About

Gerard Lovell has left Burma for Western Australia.

W. H. Goodchild is in Ireland on professional business.

John Wellington Finch, of Denver, is visiting various Nevada mining camps.

R. S. Botsford is making an examination of the Zancudo mine, at Titiribi, Antioquia, Colombia, S. A.

Rudolf Gahl, consulting metallurgist, has returned from Germany to his Berkeley, Calif., residence.

Sydney H. Ball, of Rogers, Mayer & Ball, has returned to New York after an absence of two months in Venezuela.

John Daniell, of Calumet, Mich., is making a report on the Sampson magnesite mines, in San Bonito County, Calif.

Edward T. Moore and Mrs. Moore, of Dallas, Tex., are spending their vacation in Europe. Mr. Moore is president of the Simms Oil Co.

J. V. W. Reynders, president of the American Institute of Mining and Metallurgical Engineers, visited San Francisco after the Salt Lake City meeting.

Wilbur H. Grant, mining geologist of San Francisco, has returned from a mine examination trip to British Columbia and is now on his way to Arizona.

Harry E. Sparks has just returned from the Long Lake section of northern Manitoba, where he has been engaged in examination work for the Huronian Belt Co., Ltd.

Claude Allen has been promoted to be superintendent of the Cabrestante group of mines belonging to the Mazapil Copper Co., Concepcion del Oro, Zacatecas, Mexico.

T. Skewes Saunders, consulting mining engineer, has moved his offices from the Mutual Life Building in Mexico City to Suite No. 33, Avenida, Cinco de Mayo No. 10, Mexico, D. F.

Arthur H. Lawrie, general superintendent for the Goldfield Consolidated Mining Co., at Goldfield, has returned to Goldfield from a trip to San Francisco and other Coast points.

S. Ford Eaton, one of the moving spirits in the growth of the new Nevada gold camp of Gilbert and manager for the Hassell-Monette interests, has resigned his Gilbert connections to take a position in California.

H. L. Donaldson, manager of the Kirk Gold Mines, in Kirkland Lake, was injured recently in an automobile accident and is in the hospital. His injuries are not serious, and his friends expect that he will soon be able to return to his post.

Paul Hunt, manager of the Park-Utah Consolidated Mines Co., has acquired ten claims in the West Tintic district on a bond and lease from Frank Serisko and Tony Ferkovich. A group of twenty other claims was also secured by Mr. Hunt near the Tintic Delaware.

James Brown, an old mining man of Queensland, Australia, has completed forty-three years' service as manager of the No. 4 North Phœnix mine, Gympie. He was one of the first directors of the company owning the mine, and his services with it ended only last July, when the mine was permanently closed down, after a period of more than forty-four years of existence.

Jules Labarthe, of San Francisco, has accepted the position of general manager of the Georgian Manganese Co., Ltd. The Harriman interests,

Jules Labarthe

which acquired a twenty-year concession of the manganese deposits in the vicinity of Tchiaturi, Caucausus, formed the company with the assistance of American, English, and German capital. The deposits are 100 miles from the Black Sea, transportation being by a 100-mile railroad, of which 73 miles is broad gage and 27 miles narrow gage. The railroad will be reconstructed at Poti, on the Black Sea. **S. Ricker,** chief mining engineer of the Magma Copper Co., has resigned to take the position of superintendent of mining operations in Georgia, Russia, with the Harriman interests. Both Labarthe and Ricker sailed from New York on Sept. 17 to assume their respective posts.

Fred Juliff, shift boss and foreman for many years in the service of the Calumet & Arizona Mining Co., has been promoted to the position of general foreman of the Junction mine, according to a recent announcement by officials of the C. & A. **Jack Fisher** will act as foreman of Division A of the Junction mine; **H. N. Lavender,** a former shift boss, has been promoted to foreman of Division B. Lavender has been with the C. & A. for more than a year. Previous to that he was foreman for the Cananea Consolidated Copper Co. of Cananea, Mexico. All appointments took effect Sept. 1.

Felix Edgar Wormser, according to an announcement by Colonel Henry H. Armstead, was at the annual meeting of the Canadian Mines Merger, Ltd., held on Sept. 1, in Kaslo, B. C., appointed general manager of the company. Mr. Wormser had for some years prior to June 15, 1925, been assistant editor of *Mining Journal-Press.* He recently completed an examination of the Canadian Mines Merger, Ltd., property, and the plan of development and exploration which he recommended will be carried through. Mr. Wormser left Kaslo on Sept. 5 to inspect the Cromwell mine, in the Trout Lake district of British Columbia, in which Colonel Armstead is also interested.

Obituary

Ben Williams, former general manager of the Copper Queen Mining Co., of Bisbee, Ariz., and at the time of his death prominent in California and Arizona banking circles, died at his home in Los Angeles, Calif., on Sept. 2. He was seventy-three years old. The funeral was at Rosedale Crematory, public services being conducted at St. Paul's Cathedral by Dean MacCormick. Interment was private, although more than 100 friends attended services at the church. Mr. Williams gained his most prominent position in mining circles during the period from 1885 to 1899, when he was general manager of the Copper Queen Mining Co. at Bisbee. Although retired from active life at the time of his death, he was a director of the Citizens Trust and Saving Bank and treasurer of the Los Angeles Hospital Association. Mr. Williams was born in London in 1852. He came to Arizona with his brother-in-law, D. W. Bisbee, founder of the Arizona town of that name. He served as superintendent of various mining projects until 1885, when he assisted in organizing the Copper Queen with the late Dr. James Douglas, and his brother, Lewis Williams. The pioneer is survived by his wife and thirteen-year-old son, Ben Williams, Jr., his niece, Mrs. James S. Douglas, wife of the president of the United Verde Extension Mining Co., and two grand-nephews, Lewis W. Douglas and James Douglas, Jr. Friends who mourned Mr. Williams' passing recalled a striking tribute paid to him upon the occasion of his retirement from the management of the Copper Queen. With a desire to present some token of their great respect, his associates wrote to a large jewelry firm describing Mr. Williams' character and asking that a suitable memento be designed. The request was fulfilled with a loving cup cast in pure gold, and all agreed that the choice was an admirable and a happy one. The opinion of the mining men, his associates, and friends was that Ben Williams, if anyone, was "pure gold." Mr. Williams had recently rallied from an attack of heart disease and was apparently on the road to recovery when he suffered a hemorrhage on Sept. 1, which resulted in his death suddenly and unexpectedly.

Societies, Addresses, and Reports

Impressions of the Institute Meeting at Salt Lake City

By T. A. Rickard

T. A. Rickard

THE one hundred and thirty-second meeting of the American Institute of Mining and Metallurgical Engineers, held at Salt Lake City, Utah, from Aug. 31 to Sept. 4, was a most successful convention, its pleasure and profit being due to a representative attendance, the interest of the excursions to mines and reduction works in the vicinity, and to the courtesy of the hosts, the members resident in the locality. The "Old Guard" of the Institute was well represented by the president, Mr. J. V. W. Reynders, who was accompanied by his gracious lady; Dr. George Otis Smith, the Director of the U. S. Geological Survey; Dr. Dorsey A. Lyon, Acting Director of the U. S. Bureau of Mines; Dr. L. D. Ricketts, a former president of the Institute; Mr. Charles W. Merrill, one of our vice-presidents; Mr. Abbot A. Hanks, chairman of the San Francisco section, and Mr. L. K. Armstrong, chairman of the Spokane section. Among the exponents of the arts of mining and metallurgy were Dean Frank H. Probert of the University of California, Professor James H. Hyde, of Stanford University; Professor B. Britton Gottsberger, of Yale, and Professor Henry N. Thomson, of the University of British Columbia. To these I would add the name of Mr. Edward H. Robie, assistant editor of the *Mining Journal-Press*.

Most of us, I feel sure, found the meeting attractive by reason of the renewal of acquaintance with many old friends; and that, of course, is one of the chief purposes of such a convention of technicians. The opening session was signalized by a speech of welcome from the Governor of Utah, Mr. George H. Dern, himself a notable member of our mining fraternity, as was his worthy father, who was so long identified with successful operations in the Mercur district. The Governor laid stress on the fact that the Institute existed to promote exchange of information and experience, plus the social contact. He touched upon the work of mining as a factor in the development of civilization, and stated that whereas no nation had been able to prosper without agriculture, no nation had achieved greatness without a mining industry. His speech was informal and friendly. A fitting reply was made by the president, Mr. Reynders, who, it is fair to say, endeared himself to all with whom he came in contact by his engaging personality. In his courteous reply to the official welcome, he referred to the omission of any mention, by the Governor, of the young iron and steel industry of Utah. In the state were to be found, in a condition of purity not to be excelled anywhere, the ingredients needed for making steel. It was not expected that the new industry would gain the dimensions of Gary or Birmingham, for that was a matter of freight rates, but the auspices were favorable to the establishment of a valuable addition to the many resources of Utah. I learned from Mr. Reynders later that the iron ore assays from 56 per cent upward; it is physically superior to the Lake Superior ores, and is low both in phosphorus and sulphur. The coal comes from the mines of Carbon County. It is low in ash and high in volatile constituents; and it can be used under a pressure of 12 lb. only, thereby indicating its favorable character as a metallurgical fuel.

Discussions and Their Value

Then followed the first of the technical papers, on chloridizing, by Mr. William C. Madge, who had collaborated with Mr. H. P. Allen. When questioned as to the choice between detinned scrap and sponge iron as a precipitant, the author stated that precipitation on sponge iron was the more rapid, but there was difficulty in obtaining suitable material; the Bureau of Mines had tried to produce it at Silver City and the technicians of the Chino Copper Co. had made many experiments. The price was said to be $40 per ton. The furnace used for chloridizing was one invented by Governor Dern and Theodore Holt. Here I may interject the remark that the acoustics of the room were bad, partly because the ventilation depended upon the open windows, through which the noise of the street cars was freely admitted, and partly because the walls of the chamber were plastered. It was difficult to hear the speakers, through no fault of their own.

Next came a paper on the use of cyanogen, in flotation, by Mr. E. L. Tucker. This represents a curious, and interesting, link between two diverse metallurgical processes. Professor Hyde asked some questions concerning patents, and thereby reminded most of us of his part in the great litigation over the rights of the Minerals Separation company. That seems ancient history now. I shall not refer further to the discussions of papers, because this part of my subject will have been covered by Mr. Robie. One heard that some of the discussions were good and others dull; that, of course, is a matter largely of individual interest; but I do not hesitate to say that the more valuable discussions are the conversations between individuals, and the exchanges of ideas between men off the floor of the convention chamber. Three of us had such a discussion, on the future supply of copper, after a good game of golf at the Country Club; this was one of the entertainments placed on the program for Monday afternoon. Before luncheon the delegates were invited to hear an organ recital in the Tabernacle of the Church of Jesus Christ of Latter Day Saints, the official name of the Mormon Church. It was interesting to see the famous temple of this sect, but I venture to say that the performance lacked distinction; it savored too much of an appeal to the vulgar taste, being spoiled by an excess of tremolo, à la cinema.

The Directors Meet

A directors' meeting was called for the first afternoon, on Monday. To this meeting the chairman of local sections were especially invited, but other members also were welcomed. About forty attended. A financial statement was presented. The local chairmen were asked, by the president, to report upon conditions in their territories. Some of them criticized the lack of financial support from headquarters, and objected to finding funds by means of assessments on the members of local sections. The Chicago section, it was stated, had voted to assess its members $5 apiece, but this step did not win endorsement from other sections. Approval was expressed of the policy of enlisting the younger members of the profession, and of helping them, but nothing new was suggested. The Institute magazine was mentioned, after it had been stated that it was now an essential part of the organization's activities, and that it helped to carry a large part of the overhead expenditure. The inclusion of the index entailed a cost of $6,000 per annum, and there was doubt as to how many wanted it, so a suggestion was made to mimeograph this technological index and sell copies to those who called for it. Professor Probert suggested that a précis of technology be added—that is, abstracts of all the papers presented. The president discussed ways and means for increasing the revenue of the Institute, such as an increase of dues, with a decrease of the initiation fee. Professor Gottsberger stated that it cost $250 to join a labor union, whereas some of our people objected to $15, plus $3 for the *Transactions*. The new secretary, Mr. H. Foster Bain, whose appointment has won widespread approval, closed the discussion. He stated that he had received many suggestions from members, but that some of them seemed hasty, and embodied ideas not yet crystallized. He would be glad always to consider recommendations for bettering the service of the Institute.

Utah Copper's Great Concentrators

Next day was devoted to an excursion organized by the Utah Copper Co., as represented by Mr. Louis S. Cates, the general manager, and Mr. D. D. Moffat, his assistant. These two gentlemen accompanied the party of visitors,

and by their courteous willingness to give information supplemented the physical hospitality of the company. We went first to the Magna mill, which treats 20,000 tons daily—and occasionally as much as 24,000 tons. The other mill, the Arthur plant, treats 17,000 tons daily, so that the total capacity of the two mills at present is about 40,000 tons per diem. The ore averages 0.98 per cent copper, or 19.6 lb. of metal per ton; the tailing contains only 0.12 per cent; so that the recovery is slightly over 88 per cent. The number of employees in the mills is in the proportion of thirty-eight tons per man. The accumulation of tailing is 130,000,000 tons, spread over 6,600 acres. We watched two eighty-ton railroad cars being dumped by a revolving tipple in two minutes. The grizzlies are made of I-beams protected by cast-steel caps. Strength and bigness were suggested by the gyratory crusher as we watched it at work. The flow sheet has been simplified during recent years. Thirty-six tube mills, each 6 by 10 ft. and containing 2-in. balls of chilled iron, are followed by 720 modified Janney flotation machines, in which the modifying agent is xanthate of potassium, with hard-wood creosote. The dewatering of the slime is performed by a vertical-disk filter, after the style of the Butters leaf, of which there are four to each machine. The ore is crushed to 6 per cent on a 65-mesh screen.

Magna Plant Adopts Alkaline Circuit in Flotation Work

An important change in the milling practice of the Magna plant has been the adoption of an alkaline circuit in the flotation department, instead of the acid circuit, which is still used (but shortly to be discarded) in the Arthur plant. Five pounds of lime is added per ton of feed. The American Smelting & Refining Co. used to provide the acid, but now it will sell the lime, in the form of a calcareous beach-sand, which comes from a deposit, one to six feet deep, on the shore of the Great Salt Lake near Garfield. This material proves to be a better reagent than ordinary limestone because it contains sodium and potassium salts. The Magna mill is an impressive sight; it is gratifying to note the increased efficiency of the plant, which is recovering 20 per cent more than it did eight years ago, when I made a detailed study of the operations. One blemish in our mills remains to be corrected—namely, the dust, which continues to be detrimental both to the health of the men and assuredly to the maximum operating efficiency and life of the machines.

The Spectacular Workings at Bingham

From the mill we went to the mine—a sight that cannot fail to impress a mining engineer. The top of the hill has been cut down since 1917, the change of contour being shown chiefly in the western edge of the huge excavation. The pit has been deepened 140 ft., so that the total height is 1,700 ft. It is intended to dig 1,000 ft. below the level of the pit, so that eventually the total height of the bank will be 2,700 ft. The angle of slope now is 28 deg., and it remains a nice question what the angle of safety will be when the slope is lengthened. The electric shovel is supplanting the steam shovel; at present ten of each kind are in use. The eastern hillside, opposite the present benches, is to be worked soon; we are informed that stripping will be started next spring. Eighty thousand tons is mined daily, half of this being waste. The working force at the mine is 1,700 men, which is half the total payroll of the company.

The cost of producing the copper now is 8.25c. per pound; in 1918 it was 14.53c., and in 1915 it was 6.95c. The output of copper in July was 22,000,000 lb.; the total to date is 2,156,994,111 lb., besides 644,672 oz. of gold and 6,642,-634 oz. of silver, the aggregate value of this production of metals being $374,-294,080. The dividends to date amount to $131,815,787. Surely the Utah Copper Co. is a splendid enterprise.

Visit Smelter at Garfield

From the mine we went to the Garfield smelter, a plant owned by the American Smelting & Refining Co. There we were received most courteously by the manager, Mr. R. W. Senger, and his staff. The chief improvement to be noted here is the unloading and sampling of the flotation concentrate, which at the time of my previous visit caused so much trouble on account of its moisture and stickiness. The railroad cars bringing the concentrate used to be unloaded laboriously by shoveling; now the work is done by a grab bucket operated by electric power; but the completion of the task calls for the aid of one man and a shovel. The concentrate passes over a series of drums, one of which has spikes to cut the paste, and another has slots through which a sample drops. Another means of rendering the flotation concentrate more tractable is to mix with it various coarser materials, such as jig concentrate, crude ore, crushed matte, and cement copper from the Ohio Consolidated mine.

Governor Dern Gives Reception

That evening, on our return to Salt Lake City, the members of the Institute were tendered a reception at the Governor's home. Earlier in the evening the technical sessions were in full swing, and in another room Professor Probert presided over a meeting of representatives of the Bureau of Mines, together with two or three mining engineers not connected with the Bureau, but interested in the good work it does for the industry. The chairman stated that his purpose was to elicit opinions in regard to investigations that might be set afoot, and himself suggested as a subject the study of rocks and rock masses, as a means of obtaining information in regard to the stresses and strains that cause slips, caving, and the collapse of workings. The discussion proved profitable, and should prepare the way for a valuable scientific inquiry.

Meeting Concludes with Excursions

Next day was given to various excursions, as also the last day, Thursday. Visits were made to the Murray and Midvale smelters, to Park City and Tintic, to Ironton and Tooele. On the Wednesday evening the customary banquet took place, under the toastmastership of Mr. W. Mont Ferry. Governor Dern and Mr. Charles S. Thomas, formerly Senator from Colorado, made interesting speeches. Mr. Reynders, as president, said the right thing in a manner humorous and thoughtful, as is his wont, and the present writer briefly expressed the thanks of the visitors to the members of the Salt Lake section for their courtesy and kindness throughout the meeting. The registered attendance was 372, together with 77 ladies. It only remains to say that the Institute had met twice before at Salt Lake City; this was the third, and lucky, time. All who were there will be glad to go there again.

The most significant remark made during the meeting, as far as I know, was the statement of Mr. Cates that the Utah Copper Co. had spent seven million dollars in the last four years in improving the equipment of its mine and mills. It costs money to maintain progress in the technique of such operations, and to overcome the decreasing grade of the ore.

Houghton Metallurgical Building Is the Best College Plant, Think Its Professors

Practicability Big Feature of Equipment—Replaces Structure Burned a Year Ago—Laboratories and Auditorium

The new metallurgical and ore-dressing building at the Michigan College of Mines, at Houghton, is pronounced by the professors in charge as without doubt the best and most up-to-the-minute structure of its kind in the world. The mill section of the new building was patterned after the mill-way at the University of Minnesota, with improvements suggested by experts of the United States Bureau of Mines, and the metallurgical laboratory is designed after the laboratory of the Massachusetts Institute of Technology, which is considered the best in the world.

The structure, of concrete and steel with red brick facing, is as near fireproof as modern construction can be. It is 160 x 75 ft., three stories high, and has two wings 50 x 80 ft. All the building and laboratory equipment is modern and complete.

The refining of the smelter metal can be done electrolytically or by the fire method, and the refined metal can be studied, analyzed, and tested in the metallagraphic laboratory for strength and structure. In addition to the technical equipment, the building has unusual pedagogical equipment, such as a large auditorium with its moving picture outfit and fine classrooms, conference rooms and exceptional laboratory desks and lockers, and other equipment that makes for the progress and comfort of the student. The fire assay laboratory and furnace room are equipped with showers. On the third floor of the building is a machine repair room, connected with the ore-dressing laboratory and metallurgical furnace room by a large elevator.

Recent Technical Publications

Reviews, Abstracts, and References

An Interesting New Bulletin on Manganese

Manganese—The seriousness of the situation caused by the shortage of manganese ore in the world market, and the consequent fear that a manganese famine might set in, has led Datico Zereteli to prepare a paper, 136 pages long, on the subject of "Manganese Ore, With Special Reference to Georgian Ore." "As to the future of the Georgian manganese industry," the author says, "there are two possibilities: either the Government of Georgia, in accordance with its own project, will obtain the subsidy necessary for the organization of the industry on modern lines, or the whole of the Tchiaturi manganese ore basin will be given on concession basis to the Harriman group for a period of twenty years." This statement is dated May 30 last, and, as is well known, the Harriman group has already received the concession referred to. Of the book's 136 pages, 62 are devoted to a discussion of the situation in Georgia. The publishers are Dryden Press, 8 Fifth St., Soho Square, London, England.

Chandalar District, Alaska—"Geology and Gold Placers of the Chandalar District, Alaska," is the title of bulletin 773-E, prepared by J. B. Mertie, Jr., which has just been received from the U. S. Geological Survey. It contains 48 pages and a geological map and section of the district.

Tempering Copper—The July issue of *The Metal Industry* contains an interesting short article by Adolph Bregman entitled "Tempered Copper Phantasies." In this the writer discusses the fallacy of attempting to temper this metal. He says that among the victims of this dream of tempered copper have been all types, from blacksmiths to business men.

Milling Lead-Zinc Ores—The July *Bulletin* of the Canadian Institute of Mining and Metallurgy contains a 12-page article by C. S. Parsons, of the Dominion Department of Mines, entitled "Concentration of Lead-Zinc Ores in Eastern Canada." In it are described and summarized the experiments made by the Mines Branch in this work.

Prospecting in Quebec—The paper that was awarded first prize in the 1925 Students' Competition conducted by the Canadian Institute of Mining and Metallurgy is entitled "Prospecting in Northern Quebec." It has been published in the July issue of the Institute *Bulletin* and in the July 17 issue of the *Canadian Mining Journal*. The successful student was K. W. Fritzsche.

Geology, British Columbia — "The Fissure Systems of British Columbia" is the title of the paper by Stewart J. Schofield that was presented at the annual general meeting of the British Columbia Division of the C. I. M. M. in February, and which is reprinted in the July *Bulletin* of the Canadian Institute.

Nickel Refining—F. E. Lathe is the author of an article entitled "The Chemistry of the Hybinette Nickel Refining Process," five pages long, which appears in the *Journal of the Society of Chemical Industry* for Aug. 21, 1925. The article is to be continued.

Geological Exploration—In the September *Explosives Engineer* George W. Baekeland gives a brief description of some of the things he saw while on a scouting trip in French Morocco. He says very little about geology, however.

Molybdenite—"The Concentration of Molybdenite Ores" is the title of a pamphlet by W. B. Timm and C. S. Parsons, which has recently been published by the Mines Branch of the Department of Mines, Ottawa, Canada. It is twelve pages long.

Flotation—Report of Investigations, No. 2700, of the U. S. Bureau of Mines, consists of a paper by A. W. Fahrenwald on the "Present Status of Differential Flotation." It is twelve pages in length, and has numerous tables.

Iron Ore—*The Iron Age* of Sept. 10 contains a four-page article entitled "Iron Ore From Northern Spain," by Luis Barreiro, general manager of the Morro Mining Co. at Bilbao, Spain. It presents much information concisely.

Charging Smelting Furnace—No. 1,550,401. Aug. 18, 1925. Manuel Tama, Wannsee, near Berlin, Germany, assignor to Ajax Metal Co., Philadelphia, Pa. A device for charging and discharging smelting furnaces, especially electric furnaces.

Flotation—"Barium Polysulphide in Sulphidizing Oxidized Ores for Flotation" is the title of U. S. Bureau of Mines Report of Investigation No. 2698, written by Edmund S. Leaver and Horace M. Lawrence. The results obtained in tests with this reagent are given.

Petroleum—"Petroleum in 1923," by G. B. Richardson, is the title of a pamphlet just issued by the U. S. Geological Survey. It comprises advance pages 365 to 420 of the "Mineral Resources of the United States, 1923, Part II," published Aug. 27, 1925.

Ontario Mineral Output—A press bulletin seven pages long giving the mineral production of Ontario during the first half of 1925 has been received. It has been prepared by W. R. Rogers and A. C. Young.

Finland Geology—Three bulletins issued by the Geological Commission of Finland, at Helsingfors, have been received. They are written in German, and are entitled, respectively, "Uber Das Jotnische Gebiet von Satakunta," by Aarne Laitakari; "Das Gebiet der Alkaligesteine von Kuolajärvi in Nordfinnland," by Victor Hackman; and "Die Graphitvorkommen in Finnland und Ihre Entstehung," by Aarne Laitakari.

Petroleum—An illustrated bulletin discussing the petroleum resources of Mexico and their exportation, written by Gustavo Ortega, has been received from the Department of Industry, Commerce, and Labor, at Mexico City. It contains 50 pages and several map inserts.

Helium—By a coincidence the September issue of *Mining and Metallurgy* containing an article entitled "Helium and Helium-Filled Airships," arrived just at the time when the Shenandoah disaster was being reported in the press. The text is accompanied by several interesting illustrations.

Braden Smelter—M. S. Mazany, smelter superintendent for the Braden Copper Co., Rancagua, Chile, is the author of an article entitled "Braden Copper Co.'s Caletones Smelter," appearing in the September issue of *Mining and Metallurgy*. This smelter was put into operation in February, 1922.

Mechanical Loading—Engineers interested in the subject of underground loading will want to obtain Bulletin 17, issued by the Carnegie Institute of Technology, Pittsburgh, Pa. It is entitled "Mechanical Loading in Coal Mines," and is written by F. E. Cash and E. H. Johnson. It contains 116 pages, and will serve as an interesting supplement to van Barneveld's "Mechanical Underground Loading in Metal Mines," which was reviewed in a recent issue of *Mining Journal-Press*.

Papago Geology — Water Supply Paper 499, entitled "The Papago Country, Arizona," by Kirk Bryan, which has just been issued by the U. S. Geological Survey, contains a geographic, geologic, and hydrologic reconnaisance of the Papago country, which lies south of Gila River between Tucson and Yuma, Ariz. It includes a guide to Western watering places. Until recently, the preface says, the country has had only a few white inhabitants and has seemed so waterless and formidable a region that it has rarely been visited by white men. The volume, which contains 436 pages, is based largely on information obtained in the field, and the writer of the preface states that it is the most detailed and accurate description of the region published.

Geology—Professional Paper 132 of the U. S. Geological Survey is entitled "Shorter Contributions to General Geology, 1923-1924," issued over the name of W. C. Mendenhall, Chief Geologist. It contains ten papers, including the following: "Notes on the Geology of Green River Valley, Between Green River, Wyo., and Green River, Utah," by J. B. Reeside, Jr.; "Rock Formations in the Colorado Plateau of Southeastern Utah and Northern Arizona," by C. R. Longwell, H. D. Miser, R. C. Moore, Kirk Bryan, and Sidney Paige; and "The Evolution and Disintegration of Matter," by F. W. Clarke.

Geology, Canada—The Summary Report for 1924, Part A, issued by the Dominion Geological Survey, Ottawa, Ontario, contains eleven papers describing field work done during the period covered. Among these are: "Tungsten Deposits Near Hazelton, B. C.," by M. E. Hurst; "Nickeliferous Mineral Deposit, Emory Creek, Yale Mining Division, B. C.," by C. E. Cairnes; "Genesis of the Texada Island Magnetite Deposits," by C. O. Swanson; and "Deep Borings in British Columbia and the Yukon," by E. D. Ingall. The bulletin contains 159 pages and five insert maps.

Patents

Sulphur—No. 1,551,573. Sept. 1, 1925. William Hoffman Kobbé, New York, assignor to Texas Gulf Sulphur Co., Bay City, Tex. A sulphur-containing composition consisting of diatomaceous earth impregnated with sulphur.

Sulphur—No. 1,551,574. Sept. 1, Sept. 1, 1925. William Hoffman Kobbé, New York, assignor to Texas Gulf Sulphur Co., Bay City, Tex. A method of impregnating sandstone with congealed sulphur.

Drill Bit — No. 1,552,724. Sept. 8, 1925. Ralph O. Moore, Wewoka, Okla. A rotary drill bit having a head formed with a pair of spaced and depending extensions at its lower end.

Rock Drill—No. 1,552,482. Sept. 8, 1925. Richard G. Hanson, Stafford, England. A detail of design.

Cadmium—No. 1,552,506. Sept. 8, 1925. John Burns Read and Melville F. Coolbaugh, Denver, Colo. A process for recovering cadmium as sulphate from arsenic and cadmium-bearing materials. Patent No. 1,552,595 is similar.

Oil Shale—No. 1,552,539. Sept. 8, 1925. Gaston A. Bronder, Brooklyn, N. Y., assignor of one-half to Thomas Costigan, New York; Lucia R. Bronder, administratrix of the estate of said Gaston A. Bronder, deceased. A process of extracting volatile ingredients from powdered or granulated shale.

Ash Separation—No. 1,552,197. Sept. 1, 1925. Lindell T. Bates, Mount Lebanon, N. Y. A method of separating ash from coal by flotation.

Sulphur — No. 1,552,217. Sept. 1, 1925. Carl Marx, Wyoming, N. J., assignor to Union Sulphur Co. A method of purifying sulphur by heating it under greatly diminished pressure and condensing the vapors formed in suitable chambers.

Lamp—No. 1,552,218. Sept. 1, 1925. Joseph Menapace, Latuda, Utah. An improved miners' carbide lamp.

Mining Machine — No. 1,552,909. Sept. 8, 1925. Harry L. Brown, Glen Ridge, N. J. A mining machine for use in sloping formations.

Mechanical Shovel — No. 1,551,446. Aug. 25, 1925. Robert S. Butler, Joplin, Mo. The Butler shovel, an underground loading machine.

Crushing Mill—No. 1,550,013. Aug. 18, 1925. Arthur C. Daman, Denver, Colo. Combination of a rotary barrel with a series of lifters on the interior surface inclined at an angle to the barrel axis.

Oil Shale—No. 1,551,941. Sept. 1, 1925. Robert H. Crozier, Rangoon, Burma. A vertical retort for distilling oil shale fractionally.

Core Drill—No. 1,552,755. Sept. 8, 1925. Roland M. Eyron, Beaumont, Tex. A coring apparatus including a barrel which will sever the core contained and prevent its escape.

Rotary Kiln—No. 1,550,591. Aug. 18, 1925. Edward G. Stone, Hobart, Tasmania. Combination in a rotary kiln of one or more rotatable elements with one or more comparatively water-tight chambers.

Concentration

Concentration—No. 1,551,588. Sept. 1, 1925. Harold Hardy Smith, Woolwich, Sydney, Australia, assignor to Minerals Separation North American Corporation. A process of concentrating ores by treating a pulp containing non-floatable metalliferous particles with a gaseous mixture, including a suitable per cent of both hydrogen sulphide and carbon dioxide.

Flotation — No. 1,550,512. Aug. 18, 1925. Felix Cremer, Santiago, Chile. Process of selectively separating components of metallic ores.

Flotation—Nos. 1,552,936 and 1,552,937. Sept. 8, 1925. Charles K. McArthur, Jr., Butte, Mont. A process of differential flotation of sulphide minerals involving treatment of a collectively floated sulphide product with a cyanide and an agent for reducing the differential-flotation-inhibitory influence of the contaminating flotation reagent present.

Treating Iron Ore—No. 1,549,865. Aug. 18, 1925. Julius Howells Gillis, Sudbury, Ont., Canada, assignor of one-half to Thomas Robinson, New York. Involving the use of a tank of certain construction.

Ore Reduction—No. 1,549,880. Aug. 18, 1925. Edward M. Johnson, Henryetta, Okla. A process of distilling volatile metal consisting in charging the raw material into either end of a retort open at both ends, heating the retort to distill the volatile metal, and discharging the residue.

Metallurgy

Furnace Charging—No. 1,551,606. Sept. 1, 1925. William E. Newnam, St. Louis, Mo., assignor to National Lead Co., St. Louis. A system for charging elongated furnaces.

Aluminum—No. 1,551,615. Sept. 1, 1925. Charles E. Parsons, New York, and Samuel Peacock, Wheeling, W. Va., assignors to Metal Research Corporation, New York. A process of producing metallic aluminum in a fuel-fed furnace from a charge containing carbon, a sodium-oxide producing salt, and alumina.

Slag—No. 1,551,616. Sept. 1, 1925. Charles E. Parsons, New York, and Samuel Peacock, Wheeling, W. Va., assignors to Metal Research Corporation, New York. A process for treating for glass-making purposes a basic blast-furnace slag containing combined sulphur, aluminum, calcium, and magnesium.

Dust Precipitation — No. 1,551,724. Sept. 1, 1925. Evald Anderson, of Alhambra, Calif., assignor to International Precipitation Co., Los Angeles, Calif. A method of removing suspended material from gases by passing the gas steam through a series of electrical fields.

Electric Furnace — No. 1,551,766. Sept. 1, 1925. Edmund F. Northrup, Princeton, N. J., assignor to Ajax Electrothermic Corporation, Trenton, N. J.

Metallurgy—No. 1,552,143. Sept. 1, 1925. James H. Gray, New York. A method of melting low volatile metals electrically and smelting their ores.

Blast Furnace—No. 1,552,179. Sept. 1, 1925. Samuel Bertram Sheldon, Duluth, Minn. A method of applying blast air on the full working pressure through a portion only of periphery, the portion changing during the process.

Smelting Furnace — No. 1,546,178. July 14, 1925. Abner Miller and D. H. Miller, Los Angeles, assignors to Metal Supply Co., Los Angeles. Design for a rotary smelting furnace, including method of tilting.

Aluminum—No. 1,552,728. Sept. 8, 1925. Samuel Peacock, Wheeling, W. Va., assignor to Willis G. Waldo, Washington, D. C. A process of making aluminum from a mixture of aluminum silicate, an alkali metal chloride, and carbon.

Lead Metallurgy — No. 1,551,536. Sept. 1, 1925. Alexander George Campbell, Broken Hill, New South Wales, Australia. A method of treating crude sulphide ores containing lead for the recovery of high-grade and carbonated lead and byproducts.

Nickel—No. 1,552,609. Sept. 8, 1925. N. V. Hybinette, Wilmington, Del. A nickel anode containing at least one-tenth of 1 per cent of oxygen and the process for making it. Patent No. 1,552,610, also covers this anode and a method of producing it.

Copper Reduction—No. 1,550,521. Aug. 18, 1925. John Bertram Du Faur, Turramurra, near Sydney, New South Wales, Australia, assignor to A. J. McBride and P. A. McBride, both of Adelaide, South Australia. Process for recovering copper from oxidized or roasted ore by leaching and then treating solution with sulphur dioxide and air.

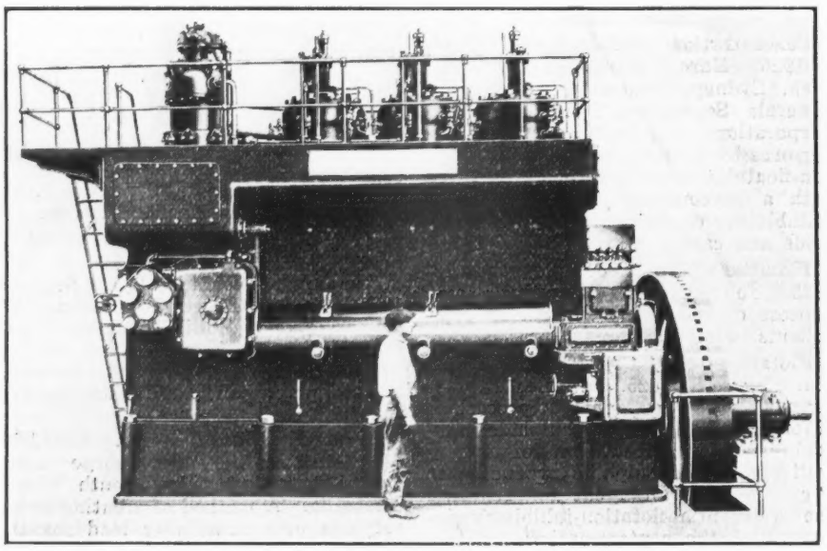
Nickel - Copper Metallurgy — No. 1,553,197. Sept. 8, 1925. Robert C. Stanley, Staten Island, N. Y., assignor to the International Nickel Co., New York. A method of separating nickel and copper in copper-nickel mattes or materials.

Copper—No. 1,551,605. Sept. 1, 1925. Phillip William Neville, East Perth, Western Australia, assignor to the Australian Minerals Recovery Co., Ltd., Perth, Australia. A process for recovering copper cement comprising the formation of a copper ore pulp containing ferrous salt and subjecting pulp to flotation in presence of reducing gas.

Copper Metallurgy—No. 1,552,029. Sept. 1, 1925. Benjamin H. Bennetts, Tacoma, Wash. A method of precipitating copper by treating a solution of copper sulphate with pulverized limestone or calcium carbonate.

Copper Metallurgy — No. 1,553,223. Sept. 8, 1925. Ferdinand Dietzsch, Valparaiso, Chile. A process of treating oxidized or roasted copper ores with a solution containing sulphurous acid dissolved in a substantially saturated solution of a metallic chloride, so as to obtain a solution charged with a complex cuprous salt, expelling the excess of sulphurous acid, and then treating the solution with an oxidizing agent to precipitate copper as a cupric compound.

New Machinery and Inventions



This new Diesel engine is of the two-stroke-cycle, single-acting, vertical type, and is buillt in three-, four-, five- and six-cylinder combinations ranging in size from 450 to 900 hp.

Another New Diesel Engine

Simpler Construction Aimed At by Designer—Force-feed Lubrication of Bearings, Oil Cooling of Piston Among Features of the Model

Those mining companies which are considering the possibilities of the Diesel engine for power-generating purposes will be interested in the new Type VH engine recently added to its line by the Nordberg Manufacturing Co., Milwaukee, Wis. This addition rounds out the Nordberg line of medium-sized units. Operation is on the full Diesel principle involving the injection of fuel by means of a blast of highly compressed air. The engine is of the two-stroke-cycle, single-acting, vertical type, built in three, four, five and six-cylinder combinations, ranging in size from 450 to 900 hp. A cylinder size of 16¾ x 22 in. gives an even rating of 150 hp. per cylinder at a speed of 225 r.p.m.

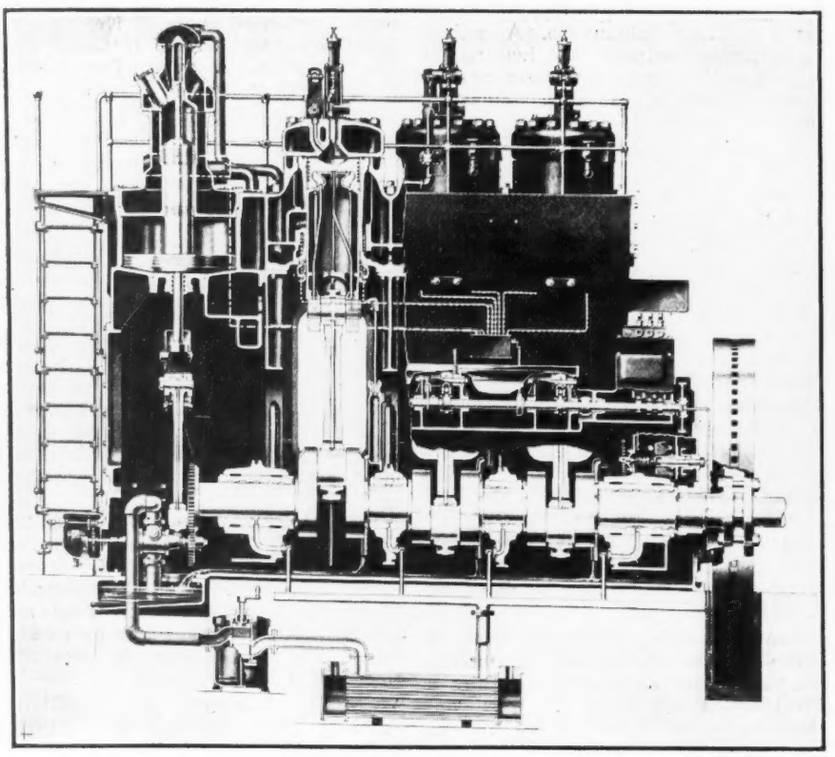
From previous designs a number of variations have been made to simplify construction and some new features have been incorporated, such as force-feed lubrication of the bearings, oil cooling of the pistons, the use of crossheads in a comparatively small engine, dual wiper rings on the piston to separate cylinder and bearing oils, and, what is more apparent in an external view, a box frame inclosing the working parts.

The engine is made up of three principal castings consisting of the bedplate in one piece, the frame and the cylinder bloc, all held together by long through bolts extending from the bedplate to the top of the cylinders. The cam-shaft bracket is cast integral with the frame and the scavenging air manifold integral with the cylinders. The upper side of this manifold has been made flat to serve as a platform giving access to the working parts above.

Oil is used for cooling the pistons, the supply coming from the pressure-lubricating system, which is of sufficient capacity to serve the twofold purpose. Draining back from the bearings into the crankcase, the oil collects in a sump at the air compressor end of the unit. A rotary pump, gear driven from the crankshaft, forces the oil through a twin strainer and a tubular cooler through which all cooling water for the engine is passed, to a pressure header, from which it is distributed to the several main bearings. Continuing through radial holes into a hollow crankshaft, the oil is distributed to the crankpins and crossheads and from the latter passes through a special pipe connection to the piston head, where it flows through a continuous spiral passage and returns to the crosshead through a pipe connection on the opposite side, from which it passes out into an open spill pipe leading to the oil sump. At the pump a spring-loaded spill valve, operated manually, is provided to regulate the oil pressure in accordance with the load on the engine. From the pressure header connections are made to lubricate the bearings of the camshaft, governor, and fuel pump. Lubrication of the power and air compressor cylinders is effected by force-feed lubricators driven from the camshaft.

In connection with the lubricating system dual wiper rings at the bottom of each cylinder prevent the contamination of pure oil by the foul oil coming from the cylinder. The upper ring catches the foul oil which is collected and carried to the outside, while the bottom ring wipes off the surplus clean oil coming from the crankpit and returns it to the lubricating system.

The fuel pump, which is of the constant-stroke type, is built up into a complete unit and mounted on top of the governor housing. The body of the pump is made from a forged-steel billet



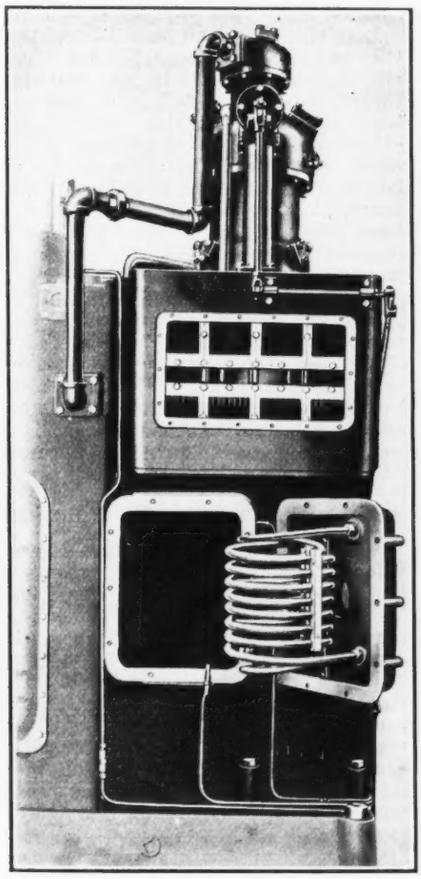
Cross-section showing design of cylinder and air pump

machined to receive the plungers, one for each cylinder, and also the suction and discharge valves which are mounted in cages. The plungers are operated by cams on a camshaft passing through the fuel pump housing and driven by spiral gears from the crankshaft. For priming each pump plunger can be operated by hand.

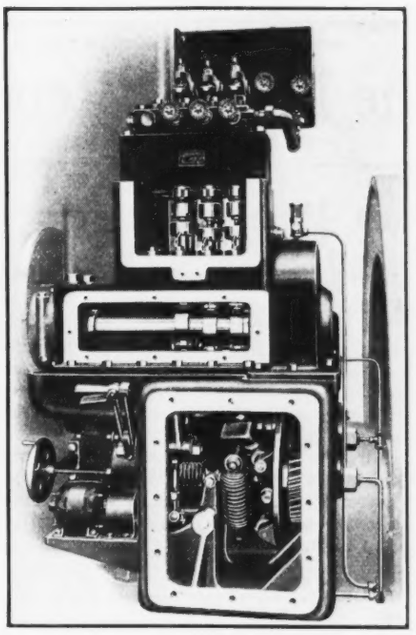
The governor functions by acting on the suction valves of the fuel pump, closing them earlier or later, depending upon the load and the amount of fuel required. One of the accompanying illustrations shows the entire fuel-pump unit, the governor and a small motor-driven synchronizing device provided to permit speed control from the switchboard for parallel operation with other power units.

As in previous designs by the same company, the air compressor and scavenging pump are combined into a single unit at the end of the power cylinder and driven from the main crankshaft. The scavenging pump is below, and above is a three-stage compressor to furnish high-pressure air for starting and fuel injection. The former is a double-acting low-pressure pump fitted with strip valves to deliver air to the scavenging header at 3 lb. pressure.

For the air compressor, copper-coil intercoolers have been located in cored cavities in the frame, there being an intercooler between the low and intermediate cylinders and the intermediate and high and an aftercooler placed beyond the high-pressure stage. The coils are attached to the covers of these cavities, which have been designed as water separators to remove moisture entrained with the air. The coils are attached to the covers so that the separator and cooler can be removed as a unit.



Scavenging pump and air compressors as seen from the side



Fuel pump unit and governor

The World's Highest Tramway

The photograph of the "highest aërial tramway in the world" which appeared on the front cover of the *Mining Journal-Press* of Aug. 8, 1925, is said to have elicited many inquiries as to the name of the company that furnished and erected it. It was the Riblet Tramway Co., of Spokane, Wash., that furnished the tramway equipment and erected it under contract. The total cost of the installation was $140,000.

An Automatic Acetylene Generator

A new acetylene generator has an automatic feeding mechanism which starts generating gas when the torch is lighted, and when the torch is extinguished the feeding mechanism automatically stops and the generating of acetylene is stopped at the same time.

The carbide is fed into the water by a simple vibrator of the dashpot principle with only one moving part. This vibrator is operated automatically by the gas flowing through it from the generator through the torch. The pressure in the generator is controlled by the tension of a spring in a diaphragm governor, and the automatic feed insures an even pressure under service conditions. Interlocking safety levers make it necessary for the operator to follow the proper sequence of operations in filling, starting, or shutting off the generator. More than fifteen pounds' pressure in the generator cannot be attained, because of a safety-blow-off. Back flashes are prevented from reaching the generator by a water seal in the gas-purifier section which cools the gas. This generator is manufactured by the Imperial Brass Mfg. Co., Chicago, Ill.

Trade Catalogs

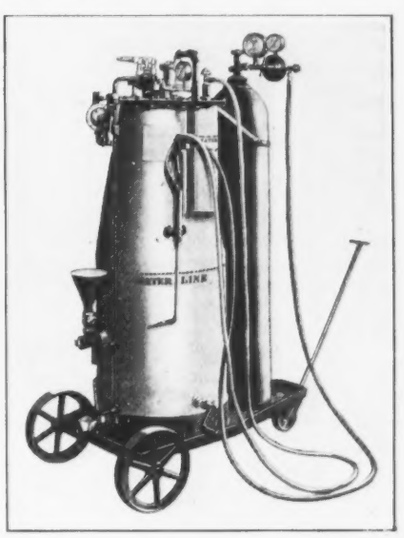
Pipe Cutter, Threader—No. 44 Beaver power drive for making up fittings, cutting and threading pipe and for making power machines of any type of hand tools is described in a small folder recently received. The Borden Company, Warren, Ohio, is the manufacturer.

Indicator, Recorder—A 4-page circular of the Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, Ill., describes the new Republic electrical level and pressure indicator and recorder.

Valve—A new catalog, dated June, 1925, describing the Merco Nordstrom plug valves has been issued by the Merco Nordstrom Valve Co., a subsidiary of the Merrill Company, San Francisco, Calif.

Power Factor Correction—"Capacitators" is the title of a 24-page bulletin issued by the General Electric Co., describing the value of the capacitator, a device intended for use in power factor correction on electric generating and distribution systems and for direct installation at motor terminals on low voltage circuits. Details are given as to operation, location, etc. Illustrations in the form of charts, diagrams, tables and photographs are used. The bulletin bears the designation GEA-77.

Hardening Furnaces—Automatic and Electric Furnaces, Ltd., 173 Farrington Road, London, England, has issued a bulletin (No. 35) on heat treatment entitled "Steel Hardening, the Interdependence of Time and Temperature." With it comes a 12-page catalog describing electromagnetic furnaces (Wild-Barfield system) for the automatic hardening of steel. This bulletin discusses the process of hardening steel electromagnetically as a preliminary to the description of the furnace.



A new acetylene generator with automatic feeding generator

The Market Report

Copper Sales Large; Prices Better

Lead Firm and in Better Demand—Zinc Prices Stiffen—September Tin Seems Scarce

New York, Sept. 16, 1925—Copper featured the non-ferrous metal markets during the week ended today, with sales in unusually large volume and the price since Saturday on the comfortable side of 14.75c. delivered. A net gain of £1 in London and the release of August statistics helped. Inquiries and sales in the lead market were better than a week ago, with 9.50c. and 9.25c. ruling in New York and St. Louis respectively. Zinc is firm at 7.75c., galvanizers being the principal supporters of the market. It is rumored that a shortage of spot tin exists in New York, this condition being reflected in the better price. Silver has declined sharply to 70⅞c. as the result of selling in China.

Daily Prices of Metals

Sept.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N.Y.	St. L.	St. L.
10	14.325@14.50	56.00	57.75	9.50	9.30	7.70@7.725
11	14.45@14.50	56.25	58.25	9.50	9.25	7.725@7.75
12	14.50	56.25	58.25	9.50	9.25	7.725@7.75
14	14.50@14.60	56.25	58.25@58.35	9.55	9.25	7.725@7.75
15	14.50@14.60	56.375	58.375@58.50	9.50	9.25	7.75
16	14.50@14.55	56.875	59.00	9.50	9.30	7.75
Av.	14.502	56.333	58.331	9.508	9.267	7.738

*The prices correspond to the following quotations for copper delivered: Sept. 10th, 14.575@14.75c.; 11th, 14.70@14.75c.; 12th, 14.75c; 14th and 15th, 14.75@14.85c.; 16th, 14.75@14.80c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
10	61⅞	62⅞	67¾	255½	258⅛	38	35¾	36 15/16	36 7/16
11	62⅛	63⅛	67¾	257½	260⅛	38 3/16	36 1/16	37 1/16	36 11/16
14	62⅜	63⅜	68¼	257⅞	260¼	38⅜	36¼	37 1/16	36⅝
15	62⅝	63⅝	68½	258⅛	260⅝	38⅝	36½	37 3/16	36 11/16
16	62½	63⅜	68½	260¾	263	38 13/16	36⅝	37 3/16	36¾

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Sept.	Sterling Exchange "Checks"	Silver		Gold London	Sept.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
10	4.84¼	72	33 3/16	84s11½d	14	4.84¼	71⅝	33	84s11½d
11	4.84⅛	72⅛	33 3/16	84s11½d	15	4.84¼	71	32 13/16	84s11½d
12	4.84¼	71⅞	33¼	....	16	4.84¼	70⅞	32⅝	84s11½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Copper Again Nears 15c.

One small lot of copper delivered in the Middle West brought 15c. yesterday, and several sales have been made at 14¾c., both in the West and in the Connecticut Valley. The tonnage, however, is small, compared with that which changed hands at 14¾c. On Thursday and Friday the preponderant volume of business was at 14.575c. delivered, but following the release of statistics showing a decrease of 10,665 tons in refined stocks as of Sept. 1, sellers immediately increased their prices, and buyers, coincidentally, came into the market. Total sales for the week were fully 50 per cent more than those of the reasonably large week ended Sept. 9, and were double that of the week ended Sept. 2. An increase of 8,532 tons in shipments to domestic consumers more than offset a decrease of 5,338 tons in the foreign consignments for August. If and when European demand assumes reasonable proportions, the copper market ought easily to pass the 15c. mark, which seems so long to have been the high limit.

Producers Pleased With Lead Situation

Inquiries for lead are better than they were a week ago. With the possible exception of white lead manufacturers, demand is good in all consuming lines. The "outside" market now coincides closely with the prices of principal producers. In New York the American Smelting & Refining Co. continues to quote 9.50c. as its official contract price, and in the West the leading interest is selling lead freely through November at 9.25c. The principal producers are well satisfied with the apparently stable condition. The estimated production of lead in the United States and Mexico in August was 1,500 tons less than in July, February alone being the only month this year when output was less. Antimonial lead is in particularly good demand as a consequence of some shortage of antimony.

Galvanizers Support Zinc Market

Active buying by galvanizers has developed, and the zinc market seems to be well established at 7.75c. for Prime Western. The principal producers of high grade early in the week increased their price from 8.75c. to 9c., demand for premium metal being brisk. The foreign market remains dull, though some interests look for stronger demand in that quarter. The American Zinc Institute supplies the following figures for all zinc-producing companies in August:

Stock Aug. 1 (short tons)	20,771
Produced	47,849
Supply	68,620
Shipments	51,588

Stock Sept. 1	17,032
Shipped from plant for export	4,354
Stored for customers	100

Retorts operating Aug. 31 totaled 85,576, compared with 82,140 operating on Aug. 1.

Spot Tin in Demand

There appears to be a shortage of tin for immediate shipment in New York. This developed in the last few days, however, the market prior to that time being dull. In London the position is reversed, and future shipment commands a good premium.

Silver Declines

During the last week the silver market has declined steadily, due to rather heavy selling of forward silver by China. India still seems disinclined to enter the market at current levels, but has shown some interest from day to day at prices below the present market. It seems reasonable to expect India to become at least a moderate buyer as the New York quotation works closer to the London parity.

Mexican Dollars; Sept. 10th and 11th, 55½c.; 12th, 55¼c.; 14th, 55c.; 15th, 54½c.; 16th, 54⅜c.

Italian Lire Maintain Gain

Little change is recorded in foreign exchange, Italian lire being steady at 4.10c. Closing quotations on Tuesday noon, Sept. 15, were as follows: francs, 4.71c.; Italian lire, 4.10c.; and marks 23.8c. Canadian dollars are at a discount of 0.0083 per cent.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £118 @ £120 per long ton for 98 per cent.

Antimony—

Chinese brands, spot, 17@17¼c. per lb.; September, 16¾@17c.

Market firm and active, with good demand for forward; spot, stagnant.

Cookson's "C" grade, spot, 19⅝c.

Needle and oxide nominally unchanged from quotations in the Sept. 5 issue.

Bismuth—$2.65@$2.70 per lb., in ton lots. London, 10s.

Cadmium—60c. per lb. London, 2s. 3d.

Iridium—$400 per oz. for 98@99 per cent. Nominal. London, £80.

Nickel—Ingot, 33@34c.; shot, 34@35c.; electrolytic, 38c.; London, £170@£175 per long ton.

Palladium—$78@$83 per oz. Crude, $65. London, £16 10s. nominal.

Platinum—$120 per oz. refined officially quoted. Sales also at $115@$118. Crude, $113.50@$114. London, £25 per oz. for refined; crude £23.

Quicksilver — $81@81.50 per 75-lb. flask. San Francisco, $81.50. London, £13 10s.@£13 12s. 6d. Market very dull.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten** and **Zirconium** are unchanged from the Sept. 5 issue.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports:

Brazilian, 42@44c.

Indian, 44c.

Caucasian (unwashed), 42c.

Caucasian (washed), 44c.

Market, both domestic and foreign, quiet. Little activity expected till first of year.

Tungsten Ore—Per unit of WO_3, N.Y.:

High-grade wolframite, $12.50. Ordinary quality, $11.75@$12. Market quiet as a consequence of large buying during the last month. Consumers fairly well covered for remainder of the year, but tone of market is stronger.

High-grade Western scheelite, $12.50 @$13, nominal.

Chrome Ore — Indian ore — second grade—offered c.i.f. New York at $19 per long ton. High grade Indian ore, $22@$23. Rhodesian ore offered at $23.

Galena and **Pyrite Radio Crystals, Iron Ore, Molybdenum, Tantalum,** and **Vanadium Ores** are unchanged from quotations in the Sept. 5 issue.

Zinc Blende Unchanged—Lead Ore Lower

Joplin, Mo., Sept. 12, 1925

Zinc Blende	Per Ton
High	$58.80
Premium, basis 60 per cent zinc	$56.00@$57.00
Prime Western, 60 per cent zinc	$54.00@$55.00
Fines and slimes, 60 per cent zinc	$52.00@$49.00
Average settling price, all	$53.56

Lead Ore	
High	$134.55
Basis 80 per cent lead	$115.00
Average settling price, all	$124.93

Shipments for the week: Blende, 19,298; lead, 2,470 tons. Value, all ores the week, $1,342,260.

Though the price offerings for lead ore have been reduced to $115, only odd lots are being purchased on that basis price—the few which must be sold each week. Lead shipments are from ore purchased on $120 to $130 basis.

A considerable tonnage of zinc sold early in the week on $55 basis, but the closing quotation today is $54 for Prime Western grades.

Waco premium-zinc sells $1 higher than Oklahoma premium, on account of a freight differential of approximately $1. This operates as a general rule on premium price quotations, and at times on Prime Western grades.

Practically all zinc blende and lead ore stocks have been disposed of, but some producers have begun withholding lead from the market.

Platteville, Wis., Sept. 12, 1925

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$56.50

Lead Ore	
Lead, basis 80 per cent lead	$115.00

Shipments for the week: Blende, 850 tons; lead, none. Shipments for the year: Blende, 33,228; lead, 1,396 tons. Shipments for the week to separating plants, 1,697 tons blende.

Non-Metallic Minerals

Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and **Zircon** are unchanged from prices in the Sept. 5 issue.

Mineral Products

Arsenious Oxide (White arsenic)—3.75c. per lb.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from prices in the Sept. 5 issue.

Ferro-Alloys

Ferrotungsten — $1.15 per lb. contained W. Market firm, with tendency toward better price.

Ferrocerium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium and **Ferrovanadium** are unchanged from the prices in the Sept. 5 issue.

Metal Products

Rolled Copper — Sheets, 22⅜c.; wire, 16½c. per lb.

Nickel Silver—29½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Sheets, 20½c. per lb.; rods, 17½c.

Lead Sheets—Rolled, 13½c.; clipped, 13½c.

Zinc Sheets — 10⅜c. per lb., f.o.b. works.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and **Zirkite** are unchanged from prices in the Sept. 5 issue.

Steel Steady—Pig Iron Firm—Coke Dull

Pittsburgh, Sept. 15, 1925

Production of steel ingots in August was 3,424,034 tons, or 10.9 per cent above production in July, the low month since last September. Production is now about 15 per cent above the July rate. Continuance of the present rate would make 1925 the fourth best year in tonnage, 1917, 1918, and 1923 having done better, but the deficiency from the record production would be only a million tons. A decrease late in the year is more probable than an increase.

Finished-steel prices are quite steady, showing no declining tendency, but, on the other hand, there is little prospect of advances in any line.

Pig Iron—The market is firm but far from active, prices being unchanged at $19 for bessemer, $18 for basic, and $18.50 for foundry, f.o.b. Valley furnaces.

Connellsville Coke.—The market has turned relatively dull again in the last few days, Eastern buyers not being so ready to take hold since prices advanced. Spot furnace, $3.50@$3.75; spot foundry, $4@$4.50.

Another Big Decline in American Copper Stocks

Figure for Sept. 1 Is 77,343 Tons, Against 88,008 on Aug. 1, and 136,434 on Jan. 1, 1925

Statistics of refined copper production, shipments, and stocks, issued by the American Bureau of Metal Statistics, show a further marked decline in stocks on Sept. 1. The figures cover refineries at Baltimore, Perth Amboy, Tacoma, Hubbell, Dollar Bay, Houghton, Hancock, Laurel Hill, Raritan, Great Falls, Carteret and Chile. Bessemer copper when produced and sold as such is included.

Copper Production, Shipments and Stocks In Tons of 2,000 Pounds

	Production			Shipments			Stock at End Period
	Primary	Scrap	Total	Export	Domestic	Total	
1919	(a)	(a)	927,604	(a)	(a)	684,182	351,061
1920	(a)	(a)	835,380	239,561	626,142	865,703	320,737
1921	(a)	(a)	537,197	282,706	307,260	589,966	267,968
1922	755,629	33,201	788,829	357,458	549,947	97,405	149,393
1923	1,136,624	27,261	1,163,885	421,872	735,521	1,157,393	155,885
1924							
First quarter	321,115	5,813	326,928	139,702	223,649	363,351	119,462
Second quarter	315,537	7,998	323,535	135,676	195,126	330,802	112,195
Third quarter	307,825	8,372	316,197	132,229	159,408	291,637	136,756
Fourth quarter	323,333	10,339	333,672	158,788	175,206	333,994	136,434
Totals	1,267,810	32,522	1,300,332	566,395	753,389	1,319,784	
1925							
First quarter	314,207	13,515	327,722	150,037	191,771	341,808	122,348
Second quarter	327,842	9,460	337,302	174,147	194,177	368,324	91,326
Second quarter average	109,281	3,153	112,434	58,049	64,726	122,775	
July	108,998	5,184	114,182	52,292	65,208	117,500	88,008
August	103,640	6,389	110,029	46,954	73,740	120,694	77,343
Totals	854,687	34,548	889,235	423,430	524,896	948,326	

(a) Not separately reported.

Smelter Production of Copper Less

Figures of the American Bureau of Metal Statistics show primary copper production by United States mines and foreign supply to United States smelters in tons of 2,000 lb. as follows:

	May, 1925	June, 1925	July, 1925	Aug., 1925	Jan.-Aug., 1925
Porphyry mines	26,860	27,017	25,870	25,783	216,115
Lake mines	6,678	7,117	6,645	7,048	51,626
Vein mines	33,462	32,821	32,066	32,115	270,954
Custom ores	3,574	2,939	3,926	3,628(a)	28,178
Total crude production	70,574	69,894	68,507	68,574	566,873
Imports in ore, matte, etc.	12,639	7,692	5,261	(b)	(b)
Blister produced from scrap	.714	1,068	1,208	1,613	6,038
Total supply	83,927	78,654	7-,976	.....	.....
Smelter production	77,041	76,587	76,335	72,861	629,995

(a) Partly estimated; revision will be made next month. (b) Not yet available.

Gold Production Increased, Silver Declined, in 1924

The Bureau of the Mint, with the co-operation of the U. S. Geological Survey, has issued the following statement of the final estimate of refinery production of gold and silver in the United States during the calendar year 1924:

States	Gold		Silver	
	Ounces	Value	Ounces	Value (a)
Alaska	303,553	$6,275,000	690,781	$462,823
Arizona	226,385	4,679,800	6,390,684	4,281,758
California	633,021	13,085,700	3,598,733	2,411,153
Colorado	420,858	8,699,900	3,549,903	2,378,435
Georgia	24	500	.....	.....
Idaho	27,085	559,900	8,036,358	5,384,359
Illinois	.....	.....	9,500	6,365
Michigan	.....	.....	155,372	104,099
Missouri	.....	.....	86,201	57,754
Montana	95,815	1,980,700	13,688,728	9,171,447
Nevada	219,976	4,547,300	9,333,197	6,253,242
New Mexico	26,742	552,800	834,933	559,405
North Carolina	97	3,000	24	16
Oregon	27,622	571,000	45,143	30,246
Pennsylvania	213	4,400	2,800	1,876
South Dakota	297,085	6,141,300	89,417	59,909
Tennessee	329	6,800	95,542	64,u13
Texas	.....	.....	718,425	481,345
Utah	153,378	3,17o,600	17,821,716	11,940,551
Virginia	5	100	.....	.....
Washington	14,130	292,100	219,372	146,979
Wyoming	10	200	.....	.....
Porto Rico	10	200	11	7
Philippine Islands	82,562	1,706,700	40,346	27,032
Totals	2,528,900	$52,277,000	65,407,186	$43,822,814

(a) Valued at 67c. per ounce, the average New York price of bar silver.

The 1924 gold production was the largest since 1919; it exceeded that of the prior year by $543,000. The year of greatest production was 1915, when the value was $101,-035,700. The 1924 silver product was materially greater than during the years 1919 to 1922, inclusive, but was 7,930,784 oz. less than that for 1923. The year of greatest silver production was also 1915, with 74,961,075 oz.

China and Indian in Silver Market

Under date of Aug. 27 Mocatta & Goldsmid, of London, makes the following comment on the silver situation:

"China has been the chief support of the market and has bought both in London and America, and there has also been a moderate demand for the Indian bazaars. How far this buying by China is merely a precautionary measure, in view of the troubles there, it is difficult to ascertain, but so long as it continues the market will have a rising tendency and some further advance seems possible. The Indian demand will largely depend upon the monsoon, the reports of which are so far satisfactory, but it is too early yet for it to cause any big up-country demand. America has been a very reluctant seller and but for some Continental selling the amounts offering would have been very small."

Tin Consumption Increases Slightly

The following tabulation from the American Bureau of Metal Statistics shows deliveries of foreign tin and an estimate of tin consumption for tin and terne plate manufacture, which probably accounts for the use of about three-eighths of the total tin consumed in the United States.

The method of following the use of tin for tin plate manufacture by months is founded on (1) a competent estimate of the quantity of tin plate manufactured, and (2) a factor representing the average use of tin per ton of plate. This factor has been rather carefully developed, and there will be but slight error on its account. There is more chance for error in the estimate of the amount of tin plate manufactured, but it is not thought that this will be of such magnitude as to preclude reliance on the monthly figures as an exhibition of the general trend of tin consumption in this industry.

Deliveries of Tin and Consumption Thereof for Tin and Terne Plate Manufacture in the United States

In Tons of 2,240 Lb.

	Deliveries of Foreign Tin as Reported by New York Metal Exchange	Consumed in Manufacture of Tin and Terne Plate
1922	57,460	22,102
1923	70,154	24,686
1924	64,125	22,820
1925		
January	7,155	2,200
February	7,205	2,000
March	7,100	2,300
April	6,655	2,400
May	4,910	2,300
June	6,175	2,566
July	6,475	2,405
August	6,520	2,499
Total	52,195	18,670

Slight Increase in U. S. Zinc Output

Figures of the American Bureau of Metal Statistics show a large increase in zinc production in the Joplin-Miami district, but a much smaller increase in the United States as a whole. The figures follow:

Zinc Production in Joplin District and United States

In Tons of 2,000 Pounds

	Ore Production	Zinc Equivalent (a)	Ore Deliveries	Total Zinc Production of United States
1921	329,320	164,660	313,800	213,614
1922	509,460	254,730	505,328	373,678
1923	668,530	334,265	671,270	531,202
1924	706,550	353,275	733,340	535,846
1925				
January	77,300	38,650	70,780	50,386
February	67,650	33,825	66,850	46,811
March	67,190	33,595	68,910	51,485
April	60,700	30,350	57,500	48,851
May	71,060	35,530	71,020	49,738
June	60,310	30,155	62,070	45,921
July	43,410	21,705	57,170	47,583
August	79,910	39,955	71,730	47,849
Totals	527,530	263,765	526,030	388,624

(a) The zinc equivalent of the Joplin ore is calculated on the assumption that 2,000 lb. of ore yields 1,000 lb. of slab zinc.

Stocks of Arsenic Increase

Figures of the American Bureau of Metal Statistics show that in spite of decreased production, stocks of arsenic in the United States increased during July. The data are:

Arsenic Production and Stocks

In Tons of 2,000 Pounds

	Crude			Refined			
		Delivered to:		Production			
Production		Refiners	Consumers	Stock at End	99 Per Cent Grade	Lower Grades	Total	Stock at End
1922	(a)	(a)	(a)	(a)	8,200	638	8,838	835
1923	(a)	(a)	(a)	2,674	10,274	2,585	12,859	1,046
1924	17,968	15,482	1,009	4,151	17,698	535	18,233	6,676
1925								
January	978	873	....	4,276	1,269	.....	1,269	6,997
February	1,224	750	89	4,651	1,218	.....	1,218	7,204
March	946	1,203	....	4,394	1,268	33	1,301	7,055
April	684	1,118	79	3,881	1,190	20	1,210	6,913
May	507	805	199	3,384	461	.....	461	6,505
June	752	863	80	3,193	1,317	.....	1,317	7,018
July	516	321	297	3,091	804	.....	804	7,085
Totals	5,607	5,933	744	.....	7,527	53	7,580	.....

(a) Not reported.

In the table printed herewith the columns under the caption of "crude" give the output and stocks of the first production. The columns under the caption of "Refined" give the products that are derived from the crude. The statistics of refined production consequently duplicate the statistics of crude production, except in so far as crude may be sold for direct consumption. Of course there is no duplication of stocks, which represent the total existing at all works at the same time. The total stock of arsenic in the first hands at the end of each month is therefore the stock of crude plus the stock of refined.

Imports of white arsenic during July, 1925, amounted to 876 short tons, making the total for January-July 6,783 tons, compared with 6,849 tons for the same period of 1924.

American Copper Exports by Destination

Germany, England, and France, in the order named, have been the principal takers of American copper, according to the following figures of the American Bureau of Metal Statistics:

	August, 1925		Jan. 1 to Aug. 31, 1925	
Destination	Short Tons	Per Cent of Total	Short Tons	Per Cent of Total
Canada	1,611	3.43	7,795	1.84
Mexico	.....	.....	214	0.05
South America	.....	.....	538	0.13
Belgium	3,735	7.96	32,241	7.61
Denmark	177	0.38	675	0.16
England	10,936	23.29	83,647	19.76
France	6,969	14.84	61,317	14.48
Germany	11,849	25.24	117,123	27.66
Holland	2,203	4.69	42,107	9.95
Italy	7,476	15.92	54,977	12.98
Norway and Sweden	1,258	2.68	10,300	2.43
Spain	420	0.89	2,422	0.57
Far East	292	0.62	9,218	2.18
Unclassified	28	0.06	856	0.20
Totals	46,954	100.00	423,430	100.00

Tightness of Money Curtails German Metal Buying

The German metal markets have been very quiet recently, consumers having well covered their needs during previous weeks, and now awaiting further developments, according to the *Metal Bulletin* of London for Sept. 4. The reluctance of buyers is increased by the fact that traders are sharply curtailing credits, owing to the tightness of money, and rumors are current of financial difficulties in several directions. The government has proclaimed a new campaign against the increasing rise in prices, which in the first instance will be directed against the syndicates, but little success can be reached in this direction, for the costs of living are growing, and unrest is increasing among the workers.

Strike in Building Trades Increases Wages

After lasting about nine weeks the strike in the building trade has now been settled by the victory of the workmen, whose wages have been increased. It is astonishing that despite the bad situation of German economic life the number of car loadings orders in July increased by 433,000, compared with June; this is, however, not a revival of trade, but the result of the movement of the grain harvest. Although German exports increased during July the imports advanced in much greater degree so that the unfavorable balance of trade grew from 321,000,000 marks in June to 411,000,000 marks in July. The new import tariff on metal and metal goods will come into force on Oct. 1, except the rates for ferromanganese, ferrochrome, ferrotungsten, ferrotitanium and ferromolybdenum.

Copper business has again slackened as consumers as usual would not buy on a falling market. The American selling agencies maintained their price firmly at above 15c., c.i.f., while second-hands were offering spot material occasionally as low as 14.65c. Even at this level consumers showed no interest. The electrical industry continues to operate at a full rate, especially the cable-makers, who are busy on domestic and foreign orders. The Deutsche Kabelwerke Co. has booked an order for 25,000 yd. for the City of Dublin at 9s. 6¼d. per 100 yd., or about 60 per cent less than the competing offers. A great quantity of cables and wire has been ordered in Germany by the Jugoslavian Postal Department to be used for improving the Belgrade telephone system. The Mix & Genest Co. has booked an order for the construction of a pneumatic post system for Zurich. The completing of the German telephone and telegraph system is progressing steadily so that most cable-makers are busy on these orders. The occupation of the brass makers has not changed. The Copper & Brassworks of Elberfeld, controlled by the Stinnes combine, are to be sold to foreign interests.

The tin market keeps very quiet. The electrical industry has absorbed small parcels and this was also the case with makers of alloys. The tin-plate works are operating better; indeed several mills are now running extra shifts to meet demands from the canning trade. Export sales are very small, only limited tonnages being sold to Switzerland, Italy and Sweden.

The demand for lead has slackened, consumers anticipating an early reduction in prices. The American selling agencies have not entered the market, better prices being obtainable in the United States. Spot material is not very plentiful but no shortage can be reported. In certain quarters some good tonnages have again been taken up to cover a short account. Prices of manufactured lead have been increased by 20 marks to 1,100 marks per metric ton.

The zinc trade ruled quiet, but the situation in Upper Silesia has slightly improved. The output of Upper Silesia in July totalled 7,804 metric tons against 7,690 tons in June and that of Germany 4,879 metric tons against 4,673 tons, making 12,683 tons against 12,363 tons last year.

The aluminum situation continues weak. Producers are able to cover all needs, but as their prices average about £2 above the Norwegian prices, fair quantities of the latter brands are imported. The official initiation of the Innwerk will take place on Sept. 5. The rolling mills which recently formed a syndicate have increased their prices for sheets by 10 per cent and for circles by 12 per cent. Negotiations are proceeding to grant an export subvention to makers of finished aluminum goods, similar to that granted by the Raw Steel Union to the makers of finished iron goods.

Mining Stocks—Week Ended September 12, 1925

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Anaconda	New York	45½	42	45½	Jy.18, Au.24, Q 0.75
Arcadian Consol.	Boston	1 1/16	1	1 1/16	
Ariz. Com'l.	Boston	13½	11½	13¼	Jy.21, Jy 31 SA 0.50
Calaveras	N. Y. Curb	...	...	1½	
Calumet & Arizona	New York	52	49	51½	Se.4, Se.21 Q 1.00
Calumet & Hecla	Boston	15½	15	15	Au.31, Se.15 Q 0.50
Canario Copper	N. Y. Curb	7½	7¼	7½	
Cerro de Pasco	New York	54½	53	54½	Au.21, Se.1 Q 1.75
Chile Copper	New York	35	33½	34⅞	Sep. 2, Sep. 28, Q 0.62½
Chino	New York	23	22	22½	Sept., 1920 0.37½
Con. Coppermines	N. Y. Curb	2⅞	2⅜	2⅜	
Copper Range	Boston	22½	19⅜	21¼	Ap.9, My.4 1.00
Crystal Copper	Boston Curb	*39	*35	*35	
East Butte	Boston	4⅜	3½	4⅜	Dec., 1919 0.50
First National	Boston Curb	*16	*15	*15	Feb., 1919 0.15
Franklin	Boston	1	*80	*85	
Granby Consol.	New York	18⅞	16½	17½	May, 1919 1.25
Greene-Cananea	New York	14½	14	14½	Nov., 1920 0.50
Hancock	Boston	*52	*52	*52	
HoweSound,new,r t.c.	New York	24¼	23	24¼	April, 1924 0.05
Inspiration Consl	New York	28⅛	26⅜	28⅛	Se.17, Oc 5, Q 0.50
Iron Cap	Boston Curb	2¾	2⅝	2⅝	May, 1923 0.15
Isle Royale	Boston	13½	13	13	Sept., 1923 0.50
Jerome Verde Dev	N. Y. Curb	*88	*85	*85	
Kennecott	New York	56⅝	53⅞	55½	Se.11, Oct.1 Q 0.75
Lake Copper	Boston	1⅜	1⅛	1⅛	Jn.1, Jn 15 Q 0 50
Magma Copper	NewYork	44⅛	42⅛	44	Oct.1, Oct.15, 0.75
Mason Valley	N. Y. Curb	2	2	2	
Mass Consolidated	Boston	*65	*60	*60	Nov., 1917 1.00
Miami Copper	New York	9⅞	9¼	9⅞	Au.1 Au.15 Q 0.25
Mohawk	Boston	33	30½	32½	Aug. 1, Sept. 2 1.00
Mother Lode Con.	New York	8	7⅜	8	Jn. 12, Jn. 30 0.37½
Nevada Consol.	New York	13⅜	13	13⅜	Sept., 1920 0.25
New Cornelia	Boston	20⅛	19½	19⅞	Aug. 7 Aug. 24 0.25
North Butte	Boston	1⅛	1	1⅛	Oct., 1918 0.25
Ohio Copper	N. Y. Curb	*90	*80	*88	No.14, De.2 0 05
Old Dominion	Boston	21¼	19	20¼	Dec., 1918 1.00
Phelps Dodge	Open Mar.	†119	†116	...	Jn 20, Jy.2 Q 1.00
Quincy	Boston	26½	24½	25¼	Mar., 1920 1.00
Ray Consolidated	New York	14½	13⅜	14⅛	Dec., 1920 0.25
Ray Hercules	N. Y. Curb	...	...	14	
St. Mary's Min. Ld.	Boston	36	33½	36	Ap. 20, My.20, 3.00
Shannon	Boston	*70	*55	*65	Nov., 1917 0.25
Shattuck Arizona	New York	6½	6½	6½	Jan., 1920 0.25
Superior & Boston	Boston	1⅜	1⅛	1⅜	
Tenn. C. & C.	New York	10⅜	10⅛	11⅛	De.31, Ja.15,Q 0.25
United Verde Ex.	N. Y. Curb	25⅛	24⅞	24⅞	Jy. 6, Aug. 1 0 50
Utah Copper	New York	100	96	100	Se.18, Se 30, Q 1.00
Utah Metal & T.	Boston	*48	*45	*48	Dec., 1917 0.30
Victoria	Boston	*40	*25	*40	
Walker Mining	Salt Lake	2.25	2.00	2.10	
NICKEL-COPPER					
Internat. Nickel	New York	34⅞	33⅛	34⅛	Se.11, Se.30, Q 0.50
Internat. Nickel pfd.	New York	...	...	97¼	Jy.16, Au.1, Q 1.50
LEAD					
Carnegie Lead & Zinc	Pittsburgh	...	...	6¾	
Gladstone M. M. Co.	Spokane	*25¾	*25½	*25½	Jy. 1, Jy. 10 0.0½
National Lead	New York	156	153	153	Sep.11, Sep.30 2.00
National Lead pfd.	New York	116½	116	116	Aug.21, Sep.15 1.75
St. Joseph Lead	New York	42½	40½	42½	Jn.9, Jn. 22, 0.50
ZINC					
Am. Z. L. & S.	New York	8⅜	8⅜	8⅜	May, 1920 1.00
Am. Z. L. & S. pfd.	New York	31⅛	28¼	30	Nov., 1920 1.50
Butte C. & Z.	New York	6½	5⅞	6½	De.10, De.24 0.50
Butte & Superior	New York	13	11	12⅛	Se.18, Se.30 0.50
Callahan Zn-Ld.	New York	2⅜	2	2⅛	Dec., 1920 0.50
New Jersey Zn.	N. Y. Curb	...	...	195	Jn.20,Jy. 10 Ex. 2.00
United Zinc	N. Y. Curb	...	...	*35	
Yellow Pine	Los Angeles	*68	*66	*68	De.10,De.15 Q 0.04
GOLD					
Alaska Juneau	New York	1⅞	1⅝	1⅞	
Argonaut	Toronto	*25½	*23½	*25	
Barry-Hollinger	Toronto	*24½	*22½	*24	
Carson Hill	Boston	...	...	*60	
Consol. W. Dome L.	Toronto	*13½	*13	*13	
Cresson Consol. G.	N. Y. Curb	3	2⅞	3⅛	Mh.31, Ap.10 Q 0.10
Crown Reserve	Toronto	*20½	*20	*20	Jan. 1917 0 05
Dome Mines	New York	15⅞	14⅞	15⅜	Se.30,Oct.20,Q 0.50
Golden Cycle	Colo. Springs	...	...	1.51	Dec.11, 1924 0.03
Hollinger Consol.	Toronto	14.91	14.85	14.90	Se.21, Oc. 7 0.08
Homestake Mining	New York	46½	46¼	46¼	Se.19, Se.25 M 0.50
Kirkland Lake	Toronto	*41	*40	*40½	
Lake Shore	Toronto	6.30	6.25	6.27	Se.1, Se.15, 0 05
McIntyre-Porcupine	New York	18⅜	18⅛	18⅜	Aug.1, Sept.1 0.25
Newray	Toronto	*22½	*22½	*22½	
Night Hawk Pen.	Toronto	...	...	*20	
Portland	Colo. Springs	...	...	*43	Oct., 1920 0.01
Rand Mines	New York	...	...	36½	Au.17, Au.25 1.52
Teck-Hughes	Toronto	1.84	1.78	1.83	
Tom Reed	Los Angeles	*55	*50	*55	Dec., 1919 0.02
Tough-Oakes	Toronto	*42½	*35¼	*39	
United Eastern	N. Y. Curb	...	...	*48	July, 1924 0.05
Vipond Cons.	Toronto	1.15	1.13	1.13	
Wright-Hargreaves	Toronto	5.50	5.15	5.45	Se.15, Oc.1 Q Ex. 0.5
GOLD AND SILVER					
Black Oak	N. Y. Curb	...	...	*81	
Con. Cortez	N. Y. Curb	*9	*9	*9	
Con. Virginia	San Francisco	5½	5½	5½	
Continental Mines	N. Y. Curb	...	...	1⅛	
Dolores Esperanza	N. Y. Curb	...	...	*50	July, 1923 0.05
Premier Gold	N. Y. Curb	2 7/16	2 3/16	2 7/16	Se.18, Oc.3, 0.08
Tonopah Belmont	N. Y. Curb	*75	*75	*75	Sep. 15, Oct. 1, 0.05
Tonopah Divide	N. Y. Curb	...	...	*23	Oct., 1923 0.10
Tonopah Extension	N. Y. Curb	1 15/16	1 7/16	1 7/16	Mh.11, Ap.1, Q 0.05
Tonopah Mining	N. Y. Curb	4⅜	4	4 1/16	Se.30, Oc. 21, 0.07½
Unity Gold	N. Y. Curb	*78	*75	*78	
West End Consol.	N. Y. Curb	...	...	*50	Mar., 1923 0.05
Yukon Gold	N. Y. Curb	*30	*30	*30	June, 1918 0.02

Stock	Exch.	High	Low	Last	Last Div.
SILVER					
Alvarado	Boston Curb	†1	*25	...	Oct. 1920 0.50
Beaver Consol.	Toronto	*29½	*29	*29¼	May, 1920 0.03
Castle-Trethewey	Toronto	1.03	1.00	1.02	
Coniagas	Toronto	1.65	1.55	1.55	May, 1924 0.12½
Keeley	Toronto	1.56	1.47	1.54	Au.31,Se.15RX 0 12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Oc.1, Oc.15 Q 0.12½
La Rose	Toronto	*42½	*41½	*42	Apr., 1922 0.10½
Lorrain Trout Lake	Toronto	100	*95	*95	Jy. 2, Jy.15 0 05
McKinley-Dar.-Sav.	Toronto	*2.24	*22	*22½	Oct., 1920 0.03
Mining Corp. Can.	Toronto	2.93	2.90	2.92	Jy.1, Jy.15 0.12½
Nipissing	N. Y. Curb	4⅞	4½	4⅝	Jn.30, Jy 20, Q 0.15
Ontario Silver	New York	7⅞	7⅜	7⅞	Jan., 1919 0.50
Temiskaming	Toronto	*18½	*17⅞	*18¼	Jan., 1920 0.40
SILVER-LEAD					
Ahumada	New York	10¾	10⅜	10¾	Se.19,Oc.2,QEx 0.25
Bingham Mines	Boston	46½	35⅝	46	Se.19, Se.30 Q 0 50
Cardiff M. & M.	Salt Lake	1.17½	1.00	1.00	De.16, No.18 0.10
Chief Consol.	Salt Lake	3.00	3.00	3.00	Ap.10, My. 1 0.10
Columbus Rexall	Salt Lake	*7	*7	*7	Aug., 1923 0.05
Erupcion	Boston Curb	2⅜	2⅜	2⅜	Se.19,Oc.2,QEx 0.15
Federal M. & S.	New York	19¾	18	19¾	Fe.26, Mh.15 Q 1.75
Federal M. & S. pfd.	New York	64⅞	59½	64	Au.25, Se.15, 1.75
Hecla Mining	N. Y. Curb	15	14¾	15	Au.15, Se.15 Q 0.50
Iron Blossom Con.	Salt Lake	...	...	*39	Oc.25, 1924 0.01½
Iron King Mining	Salt Lake	*54	*51	*51	
Keystone Mining	Salt Lake	*75	*74	*74	Au.12, Au.26 0 07½
Mammoth Mining	Salt Lake	2 77½	2 70	2.75	My.15 Mv.25 0 10
Marsh Mines	Spokane	*8	*7¾	*8	Se.15, Oc.1 0.15
Park City	Salt Lake	...	...	5.95	Jn.15, Jy.1 Q 0.15
Park Utah	Salt Lake	6.15	6.10	6.10	Se.15, Oc.1 0.15
Prince Consol.	Salt Lake	*41	*35	*35	
Silver King Coal	Salt Lake	9.25	9.05	9.05	Jn.20, Jy 1, Q 0.25
Silversmith	Spokane	*23½	*22½	*22½	Jy.1, Jy.10 0.01
Tamarack-Custer	Spokane	*58	*55	*55	Sept, 1924 0 25
Tintic Standard	Salt Lake	13.75	13.37½	13.37½	Jn.24, Jn.29 Q 0.40
Utah-Apex	Boston	7	6	7	Jy.3, Jy.15, Q 0.35
Western Utah Copper	N. Y. Curb	...	...	*11	
IRON					
Bethlehem Steel	New York	42	40½	41¾	July, 1924 1.25
Char. Iron	Detroit	...	...	*20	
Char. Iron pfd.	Detroit	...	...	*85	
Colorado Fuel & Iron	New York	40⅞	39	40½	May, 1921 0.75
Gt. North'n Iron Ore	New York	28½	27⅝	28¼	Ap.11, Ap.30 1.00
Inland Steel	New York	43½	42½	43⅜	Au. 14 Sep. 1, Q 0.62½
Mesabi Iron	N. Y. Curb	2	2	2	
Replogle Steel	New York	15¼	14½	14⅜	
Republic I. & S.	New York	51	48	50½	May, 1921 1.50
Republic I. & S. pfd.	New York	91	90½	91	Se.15, Oc.1, Q 1.75
Sloss-Sheffield S. & I.	New York	101¾	98	98	Se.10, Se.21 Q 1.50
Sloss-Shef. S.&I. pfd.	New York	...	...	97	Se.21, Oc.1, Q 1.75
U. S. Steel	New York	123	120⅝	122⅜	Au.29,Au.31,Q Ex 1.75
U. S. Steel pfd.	New York	125	124	124	Aug. 3, Aug. 29, Q 1.75
Virginia I. C. & C.	New York	...	...	33	Jan., 1924 1.50
Virginia I.C.&C.pfd.	New York	...	...	73	Jn.20, Jy.2, 2.50
VANADIUM					
Vanadium Corp.	New York	30⅞	29	30	Aug.1, Aug.15 0.50
ASBESTOS					
Asbestos Corp.	Montreal	94½	87	87⅞	Se.30, Oc.15 Q 1.50
Asbestos Corp., pfd.	Montreal	113	109	109	Se.30, Oc. 15, Q 1.50
SULPHUR					
Freeport Texas	New York	17¼	16⅜	17	Nov., 1919 1.00
Texas Gulf	New York	112	109¼	111	Au.31, Se.15, Q 2.00
DIAMONDS					
De Beers Consol.	New York	25	25	25	Jy.27, Au.30 0.97
PLATINUM					
So. Am. Gold & P.	N. Y. Curb	2⅛	2⅛	2⅛	
MINING, SMELTING, REFINING AND GENERAL					
Amer. Metal	New York	52	50⅞	51⅛	Aug. 20, Sep. 1, Q 0.75
Amer. Metal pfd.	New York	116	116	116	Aug. 21, Sep. 1, Q 1.75
Amer. Sm. & Ref.	New York	113½	108½	113⅜	Jy.10, Au.1, Q 1.50
Amer.Sm.&Ref.pfd.	New York	113	112	112½	Au.7, Se.1 Q 1.75
Consol. M. & S.	Montreal	121	118	118½	Jn.30, Jy.15 0.75
Federated Metals	N. Y. Curb	30	29	29½	
Newmont Mining	N. Y. Curb	...	...	44	
Southwest Metals	N. Y. Curb	...	...	1	
U. S. Sm. R. & M.	New York	46½	45½	46½	Jy.6, Jy.15 Q 0.75
U.S. Sm. R.&M.pfd.	New York	46¾	46¾	46¾	Jy.6, Jy.15 Q 0.87½

* Cents per share. † Bid or asked. Q. Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange and George H. Watson & Co.; Colorado Springs, Colorado Springs Stock Exchange

LONDON QUOTATIONS, WEEK ENDED AUGUST, 1925

	High	Low	Last	Date	Per Cent
Aramayo Mines (25 frs.)	76/6	74/3	75/—	Aug. 1925	5(c)
British Platinum	9/4½	8/9	9/3	Feb. 1925	2½
Bwana M'Kubwa	7/—	6/6	6/7½		
Camp Bird	2/6	1/10½	2/3		
El Oro	5/3	4/6	5/—	Nov. 1924	2½*
Esperanza	—/9	—/9	—/9		
Frontino & Bolivia	10/9	10/4½	10/6	July 1925	3¾
Mexican Corporation	13/9	13/3	13/6		
Mexico Mines of El Oro	42/6	40/7½	42/6	June 1925	10*
Nechi (pref. 10s.)	1/3	1/—	1/—	1921-22	25
Oroville Dredging	4/3	3/9	4/—	Dec. 1923	3¾
Ouro Preto	4/4½	4/—	4/—	May 1925	2½
St. John del Rey	15/6	14/10½	15/—	June 1925	6¼
San Francisco Mines	25/9	25/—	25/3	June 1925	15
Santa Gertrudis	10/3	8/10½	9/9	July 1920	5
Selukwe (2s. 6d.)	10/7½	9/4½	10/3	April 1917	6¾
S. American Copper	7/7½	7/3	7/6	Nov. 1917	75
Tanganyika	46/3	41/3	41/10½	Sept. 1925	5
Tomboy	4/6	4/3	4/6	Sept. 1925	5
Union Minière du Haut-Katanga (Brussels) 100 Fr	6.670	6.640	6.670	July 1925	150(b)

* Free of British income tax. (b) Belgian francs. (c) Swiss francs.